Business Tax and the Environment

Emissions trading as a tax reform option

Clive Hamilton

Hal Turton

Number 22

August 1999

THE AUSTRALIA INSTITUTE

Business Tax and the Environment

Emissions trading as a tax reform option

Clive Hamilton

Hal Turton

A report sponsored by the Sustainable Energy Industry Association, the Australian Cogeneration Association and the Australia New Zealand Solar Energy Society and developed with the assistance of the Sustainable Energy Development Authority of NSW

Discussion Paper Number 22

August 1999

ISSN 1322-5421

Contents

Tables and Figures

Abbreviations

A$	Australian dollars
ABARE	Australian Bureau of Agricultural and Resource Economics
ABS	Australian Bureau of Statistics
ACA	Australian Cogeneration Association
AD	accelerated depreciation
AFR	Australian Financial Review
AGO	Australian Greenhouse Office
Annex B countries	Countries listed in Annex B of the Kyoto Protocol
ANTS	A New Tax System
ANZSES	Australia New Zealand Solar Energy Society
ANZSIC	Australian and New Zealand Standard Industrial Classification
ATO	Australian Taxation Office
BIE	Bureau of Industry Economics
C	carbon
c	cents
CCAP	Center for Clean Air Policy (Washington)
CDM	Clean Development Mechanism
CER	certified emission reduction
CGE	computable general equilibrium
CGT	capital gains tax
CH_4	methane
CO_2	carbon dioxide
CO_2-e	carbon dioxide global warming equivalents
CPI	Consumer Price Index
DEWRSB	Department of Employment, Workplace Relations and Small Business
DM	Deutsche Mark
EPAC	Economic Planning Advisory Commission
FCCC	Framework Convention on Climate Change
g	grams
GHG	greenhouse gas
GJ	gigajoule
GST	goods and services tax
ha	hectares

IAC	Industries Assistance Commission
IPCC	Intergovernmental Panel on Climate Change
kWh	kilowatt hour
l	litre
LNG	liquefied natural gas
LUC	land-use change
LUCF	land-use change and forestry
mol	$6.02*10^{23}$ molecules
Mt	megatonnes (million tonnes)
MW	molecular weight (or mass)
N_2O	nitrous oxide
NGGIC	National Greenhouse Gas Inventory Committee
OECD	Organisation for Economic Co-operation and Development
R&D	research and development
SEDA	NSW Sustainable Energy Development Authority
SEIA	Sustainable Energy Industry Association
SGM	second generation model
t	tonne
WTO	World Trade Organization

Executive summary

The purpose of this paper is to explore a number of feasible reforms to business taxation that go further than the Ralph review. It proposes a redesign of the tax system in a revenue-neutral way to promote economic growth and employment while introducing economic instruments to protect the environment.

Briefly, this paper argues for the early introduction of a domestic emissions trading system as part of the tax restructuring program, in order to address our greenhouse commitments under the Kyoto Protocol and improve our standing in the world community. We recommend that tax revenues from domestic emissions trading be used to abolish payroll tax or reduce it by a large margin, so that tax reform leads to job creation.

One of the lessons of the ANTS process was that broad changes to the tax system inevitably have environmental as well as economic and social implications, and that it is better to consider these at the outset rather than trying to patch up a set of policy changes later on.

Several countries, including Germany and Britain, are now reforming their tax systems to accommodate environmental impacts. Increasingly, trade and environment are being linked internationally. In a major development, G-8 leaders ended their June 1999 summit pledging to seek 'a more effective way within the World Trade Organization (WTO) for addressing the trade and environment relationship and promoting sustainable development …'. They confirmed that environmental issues would be taken fully into account in the forthcoming round of WTO negotiations and declared that climate change is 'an extremely serious threat to sustainable development', promising to work towards 'early entry into force of the Kyoto Protocol'.

When emissions trading is integrated into various business tax reform options, it becomes apparent that a decision not to proceed with emissions trading forgoes an opportunity to reduce taxes on company profits or payrolls or other aspects of business. Since an emissions trading scheme is very likely to be introduced in the next decade, failure to address the issue in the current business tax review is likely to necessitate revisiting business tax reform within a few years, at significant additional cost.

Proposed Ralph reforms

One of the key proposals of the Ralph review was to abolish accelerated depreciation and to use the revenue to cut the company tax rate from 36% to 30%. Such a change would have the effect of creating winners and losers. Some parts of the services sector would benefit, notably:

- finance and insurance;
- real estate;
- business services; and

- retail trade.

The losers would be capital-intensive sectors, notably:

- communication;
- transport and storage;
- accommodation and restaurants; and
- (possibly) utilities.

Mining and manufacturing currently receive large benefits from depreciation deductions, and probably accelerated depreciation. However, they also pay a large amount of company tax. Their increased tax liability as a result of the abolition of accelerated depreciation is offset by a reduction in the company tax rate. However, data on the sectoral incidence of accelerated depreciation are not available.

The Ralph review provides no rationale for abolishing accelerated depreciation, but provides strong reasons for its retention in order to encourage investment, ensure a faster turnover of the capital stock and maintain international competitiveness.

From an environmental perspective there may be strong grounds to retain accelerated depreciation. It encourages faster replacement of older equipment and makes the commercial application of new technology more viable. Many renewable energy sources and most pollution prevention equipment rely on new technologies. On the other hand, the current depreciation regime favours certain resource-intensive activities such as fossil fuel-based electricity generation, mining and forestry.

One major tax, payroll tax, has not been considered by the Ralph review. Payroll tax places a significant burden on many sectors of the economy and is levied in such a way that it distorts production decisions. In addition, payroll tax increases labour costs, thereby increasing the costs of creating and sustaining employment.

Greenhouse policy

Australia's greenhouse gas emissions are growing rapidly. Energy-related emissions already exceed the 108% target Australia was allocated in the Kyoto Protocol and, unchecked, will exceed 140% of 1990 levels in 2010. Current policies are wholly inadequate and without a major policy development in the next two years, Australia has no chance of meeting its international commitment.

The only feasible policies are an emissions trading system and a carbon tax.

As the Federal Government has ruled out a carbon tax, a decision not to proceed with emissions trading (or to delay a decision for a few years) in effect signals an intention not to comply with the Kyoto Protocol. The parties to the Climate Change Convention are now considering the consequences for countries that fail to comply. They range from 'appropriate assistance' and cautions, to suspension of rights (including the ability to engage in emissions trading and the Clean Development Mechanism) and financial penalties.

Additionally, emissions trading will rapidly develop into a large and valuable instrument of financial exchange and its undue delay may well set back the aspirations of Sydney to become an international financial centre.

The Federal Government strongly supported emissions trading in the Kyoto Protocol and has opposed recent European moves to place limits on parties to meet their obligations through international emissions trading. The government has also expressed interest in developing a domestic greenhouse gas emissions trading system.

This system would provide Australian-based firms with a 'first-mover advantage' when the international emissions trading system begins to operate. Economic transitions involving structural change are costly and procrastination expensive. The more time firms have to replace capital equipment and redesign products, the lower their ultimate costs will be. A domestic system would also allow many existing greenhouse programs to be abolished.

As far as possible, a domestic emissions trading system needs to be compatible with the expected international system, but it is not dependent on this. Moreover, while emissions trading under the Kyoto Protocol is relevant for meeting emissions targets only in the commitment period 2008-2012, the domestic system described in this paper would apply from the year 2001 through to 2012. In addition to providing an effective domestic policy to reduce emissions, it will also serve as a substantial source of Commonwealth revenue and therefore has direct bearing on the structure of business taxation now under review.

Put simply, no sensible reason exists as to why Australia should not be a leader in developing an emissions trading system. Indeed, given Australia's favourable treatment at Kyoto, the swift introduction of emissions trading would send a signal to our critics in the world community and improve our international standing.

The emissions trading system

The scheme proposed here is a 'cap-and-trade' system in which legislation would limit the amount of greenhouse gases that major emitters can discharge through permits to emit. Using an 'upstream' approach, it would cover CO_2 emissions from all fossil fuel combustion. Financial penalties would be imposed on entities that emitted greenhouse gases without sufficient permits. An entity that holds a permit may choose to acquit it against its own emissions or sell it to another entity. The permits would be allocated by an auctioning process. It is proposed that the scheme begins in 2001 and runs through at least until 2012, the end of the current commitment period under the Kyoto Protocol.

This system would cover 72% of total net emissions of all greenhouse gases in 1996 (excluding land-use change). The upstream approach would require only around 160 sites (refineries, gas plants, coal mines, etc.) to own permits, thus greatly reducing the administrative complexity. However, one drawback of the upstream approach is that energy users may not respond as quickly to price signals as opposed to quantitative limits.

The proposed trading scheme has the following additional features:

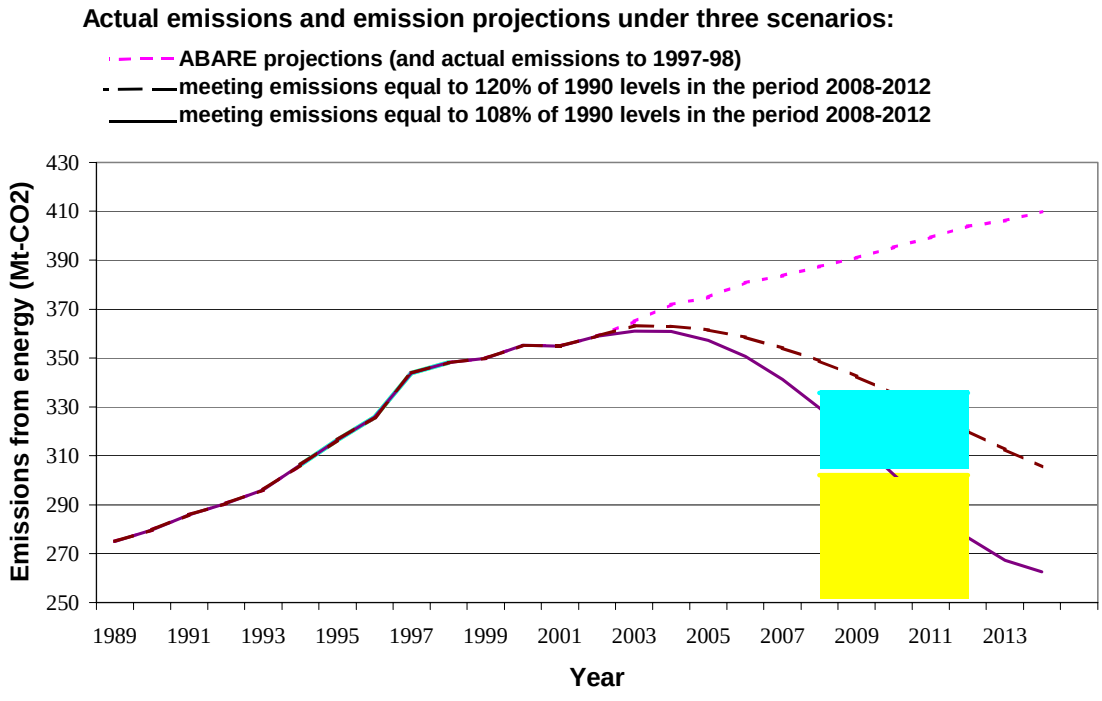
- it allows for the banking of permits over time (and possibly limited borrowing);
- emission credits generated by forest sinks can be included;
- concessions are granted to energy-intensive firms for exports to countries that do not have emission caps;
- provision may be made for partial grandfathering (i.e. free transfer of permits to polluters based on historical emission levels); and
- it allows for the incorporation of credit for early action.

Permit prices and revenue

Declining emissions from land clearing will permit emissions from energy consumption to be substantially higher than the 108% of 1990 levels agreed in the Kyoto Protocol while still allowing Australia to meet its commitments. A target of at least 120% is realistic. However, there are good grounds for setting the desired emission levels from energy at 108%. On this basis the proposed path of emissions and allocation of emission permits for each year over 2001-2012 are shown in the figure below. The opportunity for the banking, and limited borrowing, of emission permits means that actual acquittals will deviate from the mandated path.

The prices of emission permits will reflect the divergence between the number available and the demand for them. The demand for permits will be influenced by

Path of emissions for targets of 108% and 120%



expected growth in demand for products responsible for emissions and the cost of abatement, which in turn will be affected by technological change. The price of permits in a domestic market is very likely to be higher than the price in an international system.

Estimating the likely price of emission permits is difficult, but information is available from economic modelling exercises and from the existing market for 'carbon offsets'. Due to their assumptions, modelling estimates tend to overstate the likely price. After reviewing the evidence, we expect the price of emission permits in a domestic system may be around $20 per tonne of CO_2, and possibly lower. We have used $20 as a benchmark, along with $15, in calculating the revenue expected from auctioning permits.

Tax reform options

At a price of $20/t of CO_2, auctioning permits would generate annual revenue of around $7 billion, and around $5 billion for a price of $15. Various business tax reform options can be built around this revenue stream including one or more of the following changes:

- reducing the company tax rate;
- changing accelerated depreciation; and
- reducing or abolishing payroll tax.

Four options are shown in the table on the following page.

It should be noted that company tax and accelerated depreciation are tax instruments applied to company profits while payroll tax and emissions permits are taxes applied to business inputs. Changes in these taxes may affect business behaviour differently. In some circumstances, input taxes may be fully passed on to consumers.

Option 1 (see table) illustrates how the proposed reduction in the company tax rate could be financed by introducing emissions trading. Accelerated depreciation could be retained under this option and, even with a permit price closer to $15 per tonne, excess revenue would be available to reduce other taxes. Option 2 illustrates how additional revenue from the abolition of accelerated depreciation could be combined with the measures in Option 1 to reduce payroll taxes.

However, there may be grounds for retaining some form of accelerated depreciation allowance to promote capital investment. There is also scope to reduce the company tax rate, but in stages. Option 4 shows the impact of reducing the company tax rate from 36% to 33% and replacing accelerated depreciation with an effective life treatment with a 50% loading. These two measures still provide for a large reduction in payroll tax.

Given the uncertainty associated with the revenue that would flow from emissions trading, it may be desirable to decide to reduce payroll tax by the amount of revenue generated through auctioning emission permits, perhaps as some variation on Option 4.

Options for business tax reform including introduction of emission trading

Tax changes	Revenue implications ($m in 2003/4) Permit price $20/t	Permit price $15/t
Option 1		
Emissions trading scheme	+7,200	+5,400
Reduce company tax rate to 30%	–3,100	
Retain accelerated depreciation	0	
No change in payroll tax	0	
Net revenue effect	**+4,100**	**+2,300**
Option 2		
Emissions trading scheme	+7,200	+5,400
Reduce company tax rate to 30%	–3,100	
Abolish accelerated depreciation	+2,400	
Reduce payroll tax by 60%	–5,700	
Net revenue effect	**+800**	**–1,000**
Option 3		
Emissions trading scheme	+7,200	+5,400
No change to company tax rate	0	
Abolish accelerated depreciation	+2,900	
Abolish payroll tax	–9,500	
Net revenue effect	**+600**	**–1,200**
Option 4		
Emissions trading scheme	+7,200	+5,400
Reduce company tax rate to 33%	–1,550	
Replace accelerated depreciation with effective life +50% loading	+900	
Reduce payroll tax by 60%	–5,700	
Net revenue effect	**+850**	**-950**

While company tax applies to all sectors equally, accelerated depreciation favours industries that are capital intensive, payroll tax disadvantages industries that are labour intensive and emissions trading will favour industries that have low energy intensities. The actual effect on industry costs and revenue will depend on the extent to which the cost of emission permits can be passed on to consumers, both private and business.

A number of economic modelling studies strongly suggest that Options 2, 3 and 4, involving abolition or a large reduction in payroll tax along with auctioned emission permits, would result in net job creation at the same time as reducing greenhouse gas emissions – a 'double dividend'. Since Australia is already committed to its Kyoto target, it makes sense to meet it in a way that redistributes the burden of taxation so that unemployment is reduced.

There are concerns that higher energy prices due to the cost of emission permits would disadvantage poorer households. Modelling studies confirm this, but higher prices would be much less regressive than is commonly thought. Against this, tax

reform that results in net employment creation will promote equity as unemployment is one of the principal causes of inequality. In addition, some of the revenue from auctioning emission permits could be ear-marked for compensation, through pension increases and reduced income taxes for low-income earners. Supplementary policies could promote the spread of highly fuel-efficient vehicles and energy-saving household equipment, so that over time, while each litre or kilowatt of fossil fuel-based energy might rise in price, overall fuel bills will decline.

Emissions trading requires a higher priority in the policy debate

This paper argues that emissions trading should be given a higher priority in the development of business tax and general economic policy. Emissions trading has the potential to become an important tool in environmental protection and economic and fiscal management, while at the same time promoting competitiveness and improving Australia's international standing.

Australia's handling of Jabiluka has brought our green credentials into question. Meanwhile, the nexus between trade and environment at the WTO is strengthening, a trend that can only continue. Having received preferential treatment at Kyoto, the international community will be paying close attention to our efforts to meet our greenhouse commitments.

Environmental considerations aside, the early introduction of emissions trading is required for effective and fundamental economic management. At some stage emissions trading will be introduced in Australia; the Government, industry and the bureaucracy all recognise it is inevitable. The only question is when. We believe it should be soon in order to provide Australia-based firms with a 'first-mover advantage' when international emissions trading begins. Early introduction will also permit many existing greenhouse programs to be abolished and improve Australia's standing in the world community.

The question then remains of how revenues generated from this scheme are to be applied as part of the tax restructuring program. We argue that the maximum benefit will be obtained by abolishing payroll tax, or reducing it by a large margin. Such restructuring will deliver the double dividend of reducing our greenhouse gas emissions and of creating jobs.

1. Introduction[1]

In 1998, the Federal Treasurer commissioned John Ralph to conduct a review of the business taxation system in Australia (Treasury 1999). The review is an integral part of the tax reform plans of the Coalition Government.

One of the motivating forces of the review of taxation is to develop a simpler system of business taxation that provides incentives that are consistent with national economic and other objectives. In its document on the GST package – known as A New Tax System (ANTS) – the Government identified the 'inconsistent taxation treatment of business entities and the investments they conduct' as the fundamental problem with the current business taxation system (ANTS 1998, p. 107).

There has been no acknowledgement by the Government or the Ralph review that the current tax system introduces serious distortions in investment decisions by failing to take account of the costs imposed on society and on other businesses by polluting activities. In the case of greenhouse gas emissions, it is now widely understood that emissions impose costs and that failure to require the polluter to pay these costs will impose a burden on others as Australia moves towards reducing emissions in accordance with domestic policy and international obligations.

One of the lessons of the ANTS process was that broad changes to the tax system inevitably have environmental as well as economic and social implications, and that it is better to consider these at the outset rather than trying to patch up a set of policy changes later on. Like the ANTS document before it, the Ralph review has ignored the environmental implications of business tax change. This is all the more remarkable given the rapid changes in the rest of the developed world in which environmental effects are increasingly recognised as an essential aspect of tax reform.

International moves on tax and environment

Internationally, it is now accepted that tax reform presents an opportunity to stimulate economic growth and employment whilst protecting the environment. In 1994 the European Commission indicated that 'it seems that a review of the existing tax …[schemes] is needed for broader economic and employment reasons. The coincidence between this situation and the need to introduce corrective taxes for environmental reasons should be exploited with the view to realising possible synergies' (Gee 1996a, p. 22).

Studies in the USA are consistent with the European position, indicating that taxes on capital and labour cost the economy 40-90 cents for every dollar of tax collected (Gee 1996b, p. 20). Eminent Harvard economist N. Gregory Mankiw has suggested cutting income taxes by 10% and increasing taxes on gasoline by 50 cents per gallon to increase economic growth and employment in the USA (*Fortune* 12 May 1999). The UN special advisor on the environment, Maurice Strong, has called for the

[1] This report was made possible by support provided by the Australian Cogeneration Association, the Australia New Zealand Solar Energy Society, the Sustainable Energy Development Authority of New South Wales and the Sustainable Energy Industry Association. We would like to thank Hugh Saddler, Alan Pears, Chris Dunstan, Ric Brazzale and Andrew Helps for their comments on a draft of this paper. Any opinions expressed in this report are those of the authors and do not necessarily reflect those of ACA, ANZSES, SEDA or SEIA.

introduction of similar revenue-neutral measures, specifically an increase in taxes on automotive fuels combined with the provision of tax credits and energy-efficiency incentives (*National Post* Canada 20 May 1999).

Other countries are further down the path to redressing poorly designed tax systems. For example, the British Government plans to introduce a carbon levy and use the revenue to reduce employer national insurance contributions (a tax on labour) (*The Times* of London 28 June 1999). Similarly, Germany is in the process of implementing a DM8.5 billion eco-tax package that will increase taxes on petrol, electricity, heating fuel and other energy products, but reduce employment charges to lower unemployment (*Reuters* 18 December 1998). These packages recognise that taxes on labour that increase non-wage labour costs reduce employment incentives and growth (Gee 1996b, p. 20). Denmark and Sweden introduced similar measures earlier this decade. In 1993 Denmark introduced a carbon tax on energy use in households, and extended it to the manufacturing industries in 1995. This was coupled with a reduction in income tax levels and targeted funding of energy-efficiency. In 1991 Sweden introduced a carbon tax and recycled the revenue to reduce income taxes (Gee 1996b, p. 31-33).

Increasingly, trade and environment are being linked internationally. In a major development, G-8 leaders ended their June 1999 summit pledging to seek 'a more effective way within the World Trade Organization (WTO) for addressing the trade and environment relationship and promoting sustainable development …'. They confirmed that environmental issues would be taken fully into account in the forthcoming round of WTO negotiations and declared that climate change is 'an extremely serious threat to sustainable development', promising to work towards 'early entry into force of the Kyoto Protocol'.[2]

The Ralph proposals

The Ralph review process has examined the taxation treatment of different entities, different forms of investment income and tax expenditures on assets. The review proposes two revenue-neutral 'trade-offs' and explores a number of options within these two proposals. The first trade-off is a broadening of the company taxation base and a concomitant reduction in the company tax rate. The main source of additional revenue from the broadening comes from the removal of accelerated depreciation. Some of the implications from this proposal are examined in Section 2 of this report. The second trade-off comprises alterations to the taxation arrangements applying to capital gains.

The review process has restricted itself by demanding both revenue neutrality and a narrow focus on existing approaches to taxation. One of the Government's criticisms of the existing business taxation system is that it is 'outdated and becoming beyond repair' having been based on a 'narrow legislative framework founded in the 1930s' (ANTS 1998, p. 107). However, the narrow focus of the Ralph review has limited its ability to overcome these problems and to create a tax system that is relevant to Australia's emerging needs. There are other more effective ways in which business tax reform could be carried out in a revenue-neutral manner. The proposal put forward by the Ralph Committee to lower the company tax rate and change the treatment of capital depreciation is hardly revolutionary, employing the same revenue

[2] *Environmental News Service*, 6 June 1999 (http://ens.lycos.com/ens/jun99/).

measures and slightly altering the rates and tax expenditures. It does not update the taxation system to deal with the demands facing Australia in the next century.

A truly modern system would be designed to reflect changing economic structures, investment practices and taxation goals. A modern tax system would not be biased towards unproductive assets, nor would it favour short-term speculative investment over longer-term investment. Most importantly, a modern tax system would not provide incentives for activities that government is trying to discourage with other policy instruments. The burning of fossil fuels is a case in point. Nor should the tax system discourage activities that are socially beneficial and which government is otherwise trying to promote, such as employing people.

Australia's tax system has high labour taxes, and taxes on capital investment that inhibit employment and economic growth. In addition, Australia has a number of environmental problems it is trying to address. Unfortunately, the Ralph review chose to ignore international trends in taxation and advocate instead what are relatively minor changes to an outdated tax system that taxes labour and capital heavily and leaves major 'externalities' untouched. The current round of tax reforms represents an opportunity to redesign the tax system in a revenue-neutral way to promote economic growth and employment while introducing economic instruments to protect the environment.

The purpose of this paper is to explore a number of feasible reforms to business taxation that go further than the Ralph review in trying to meet these requirements. It is by no means a comprehensive approach to business tax reform, but it does broaden the considerations and provide some analysis of the likely economic effects of various business reform options. It proposes a means of redesigning business taxation to promote investment and employment growth while at the same time promoting the development of some of the key industries of the next century and assisting Australia to meet its legally-binding obligations on the emission of greenhouse gases. The principle behind this approach to taxation reform is that perverse incentives to create pollution that run counter to the government's own policies are removed and funds are redirected towards productive investment and employment-creating industries.

Options for tax reform

The current review of business taxation provides an excellent opportunity to consider the introduction of greenhouse gas emissions trading, and thereby to integrate the government's climate change objectives into the tax system of the next century. Too often the introduction of emissions trading has been dismissed as yet another impost on business. This of course ignores the impost on the community and other businesses of failing to introduce measures to curb emissions. By integrating emissions trading into various revenue-neutral packages of business tax reform measures, it becomes apparent that a decision not to proceed with emissions trading forgoes an opportunity to reduce taxes on company profits or payrolls or other aspect of business. Since an emissions trading scheme is very likely to be introduced in the next decade, failure to address the issue in the current business tax review is likely to necessitate revisiting business tax reform within a few years.

In the following section we first examine the merits and likely sectoral effects of the Ralph review's proposed company tax-accelerated depreciation swap. This section

also considers the incidence of payroll taxation. We then turn to the nature of Australia's commitment to reduce greenhouse gas (GHG) emissions and the implications for policy. A scheme for auctioned emission permits that will allow Australia to meet its obligations and stimulate the sustainable energy industries of the next century is put forward. Different options for business tax reform are then examined, options that combine changes in company taxation, depreciation provisions, payroll tax and emissions trading, all of which have substantial revenue implications.

Commentary on business tax reform has been notable for the absence of discussion of clearly defined benefits from reform. Vague references are made to improving efficiency and international competitiveness. This study argues that well-defined and substantial benefits can be had from business tax reform, especially increased employment and lower greenhouse gas emissions, the so-called double dividend. *Prima facie*, this makes some of the options considered in this study clearly preferable to the vague promises of the options in the Ralph review.

2. The current business tax system and the Ralph review

2.1 Introduction

This section evaluates one of the major proposals advocated by the Ralph Committee – a reduction in the company tax rate funded by the removal of certain investment allowances, particularly accelerated depreciation. Section 2.2 examines the nature of accelerated depreciation and attempts to identify the industry sectors that benefit most from the current business tax system. Section 2.3 makes some observations on the environmental implications of accelerated depreciation. We next provide an initial assessment of the effect of a reduction in the company tax rate on various industry sectors. These two analyses are then used in Section 2.5 as the basis for a brief discussion of the possible economic impacts of the Ralph proposal. Some of the issues of capital gains tax (CGT) are discussed in Appendix 5.

Section 2.6 examines a business tax that has not been considered in the Ralph review – payroll tax. The design of payroll tax is reviewed and the industry sectors most affected are identified. This is in no sense a thorough modelling exercise, but is designed to identify the broad winners and losers under the proposed Ralph reforms, and to identify other areas for reform.

2.2 Accelerated depreciation

Definition and tax treatment

Depreciation is defined as the decrease in the value of an asset as it ages, accounting for factors such as wear and tear and technological redundancy. For tax purposes depreciation is like any other expense. To simplify, a firm pays tax on its profits, these being the difference between gross revenues and gross expenses. Expenses include payments to suppliers and employees, consumables, interest payments and so on. The purchase of an asset that lasts longer than one year is not, however, an expense. Instead, the firm is able to claim the depreciation of that asset as an expense, thereby reducing its taxable income. In a sense, the firm is claiming the proportion of the asset 'used up' in making taxable income. This is a simplified description of depreciation, some aspects of which are discussed in greater detail in the following sections.

Rate of depreciation

Some assets depreciate quickly (e.g. computers), while others depreciate very slowly (e.g. some buildings). The rate of financial depreciation should be distinguished from the rate of economic depreciation, where the latter refers to the declining physical productiveness of the asset. Furthermore, for some assets the rate of depreciation varies, often depreciating rapidly early in their lives and more slowly subsequently. The rate at which an asset depreciates determines the time over which the cost of that asset can be deducted from profits for tax purposes, and the size of those deductions. However, since in practice actual rates of depreciation are difficult to determine, rules of thumb are generally used. It is important to recognise that the maximum amount that can be deducted over the life of an asset is determined by the purchase price of the asset, so that the total deduction will always be the same, irrespective of the period

over which depreciation is claimed for tax purposes.[3] But having the tax benefit in hand earlier offers the opportunity for business to repay debt more quickly, reducing total project costs. Where business investment decisions are taken using high rates of discounting, rapid depreciation in the early years of the investment makes the investment more likely to proceed.

In many cases the Australian Tax Office (ATO) has determined a statutory period over which assets can be depreciated, irrespective of the actual physical life of the asset. These rates vary according to the type of asset and the activity for which they are used. A good example is the treatment of buildings. Industrial buildings can be written off over a period of 25 years, rental buildings over 40 years (except hotels which are written off over 25 years), mining buildings over a maximum of 10 years and quarry buildings over a maximum of 20 years. In many such cases, the physical and productive life of the building is much longer than the statutory period. In this case, the rate of depreciation for taxation purposes is accelerated relative to the true value of the asset. Conversely, in the case of some assets the statutory life is longer than the effective life – for example, the ATO sets a statutory life for computers of 5 years, whereas computers are often obsolete within 3 years (Treasury 1999, p. 91). The statutory life-spans of a range of capital assets are set out in Appendix 1.

Accelerated depreciation

The argument for accelerated depreciation is based on a widely recognised problem inherent in effective-life depreciation. The company tax system allows depreciation based on historical cost, not on replacement cost. Accordingly, in inflationary conditions, effective-life depreciation based on historical cost is an inadequate measure of the true reduction in the economic value of an asset.[4] This phenomenon reduces the incentive to invest in depreciating assets and provided the justification for the introduction of accelerated depreciation (for a discussion see Ryan 1990). Other arguments have also been used to justify accelerated depreciation, including the fact that labour costs are immediately deductible compared to capital costs, and therefore capital investment is already disadvantaged (IAC 1976, p. 23).[5] The particular circumstances faced by some industries have also been used to justify favourable depreciation tax treatment. For example, the mining industry has received preferential treatment because it faces greater risks, longer lead times, and must operate in remote locations compared to other industries (IAC 1976, p. 2). Research and development also receives favourable treatment because of larger risks and because the benefits of R&D often spill over to the rest of industry and society.

[3] An exception is when the asset is used for research and development purposes. Under current rules, 125% of the costs of R&D may be deducted.

[4] For instance, suppose a firm purchases an asset for $1000 in 1990 and that asset loses 10% of its value per year through wear and tear. If depreciation of 10% per year can be claimed for tax purposes then the firm is able to claim *nominal* depreciation of $100 per year (i.e. $100 in 1990 dollars in 1990, $100 in 1991 dollars in 1991, and so on until the end of ten years). If $100 in 1990 is worth more than $100 in subsequent years because of inflation, then in each year after purchasing the asset the firm is claiming a smaller *real* depreciation (perhaps $95 in 1990 dollars in 1991, $90 in 1990 dollars in 1992 and so on). Accordingly, the firm is not claiming the true depreciation of the asset. It is slightly more complicated, however. With positive inflation, the real value of debt is reduced and nominal deductions for payments on debt used to finance the asset purchase are larger than the real cost of that debt.

[5] This argument ignores the fact that the cost of capital (i.e. interest) is deductible.

The effect of accelerated depreciation is to allow firms investing in assets to reduce their tax liability in the allowable depreciation period to a greater extent than otherwise while increasing their liability after that period. For example, where a power station lasts 30 years but is depreciated over 20 years (Treasury 1999, p. 91), the company that owns[6] the facility is able to reduce its tax liability during the first twenty years, but has an increased liability in the final ten years when it generates income from the power plant but cannot deduct any more depreciation expenses.

As was noted earlier, irrespective of the period over which an asset is depreciated, the total depreciation (and hence deduction) is always the same in nominal dollars. Accordingly, any taxation benefit accrued as a result of accelerated depreciation is offset by increased taxation liability at a later date. Effectively, accelerated depreciation is a means by which to defer tax, and can be considered to be an interest free loan from the government to the deductee (Treasury 1999, p. 81). This means the beneficiaries can effectively use 'interest-free loans' for financial benefit, so that they do gain a net benefit in real terms from the mechanism.

Beneficiaries of accelerated depreciation

A partial list of the assets and activities that may qualify for some form of accelerated depreciation is presented in Appendix 1. Whether or not the treatment of these activities and assets actually provides for accelerated depreciation (relative to real world depreciation) depends on the effective lives of the assets involved. It should be noted that claims for depreciation of capital expenses benefit only those companies with a taxable income. The R&D depreciation allowance scheme has been criticised on the grounds that it does not assist smaller start-up companies that do not have taxable income.

The Ralph report estimates that replacing accelerated depreciation with effective life depreciation would result in a revenue gain of $2.4 billion by the year 2003-04. This figure provides an indication of the value of the net benefits to all industries of accelerated depreciation.[7] In estimating this figure, the Ralph Committee needed to make a number of assumptions and simplifications. Firstly, the average age of the capital stock was calculated using information on purchases and sales of depreciable assets over previous years. The distribution (or the spread) of asset lives around this average was also estimated. Finally, assumptions were made about the method of depreciation, the growth in future investments and the distribution of asset lives according to the purpose of the assets (*pers. comm.*, Ralph Committee Secretariat). This naturally embodies considerable uncertainty. Surprisingly, the Ralph Committee did not report the break-down by industry sector of depreciation deductions.

An analysis of depreciation deductions (accelerated or otherwise) compared with tax paid provides a useful indication of the industries that benefit most from accelerated depreciation.[8] Table 2.1 compares the level of depreciation deductions with net tax

[6] In some cases it is not the owner who claims the depreciation deduction, but lessees, quasi-owners or contributors of capital (Treasury 1999, p. 80).

[7] This is the impact assuming the company tax rate has been changed to 30%. The figure would be larger (around $2.9 billion) if the company tax rate was maintained at 36%.

[8] The level of deductions gives an indication of the capital intensity of an industry or firm. A high level of deductions indicates that the industry invests a substantial amount in depreciable assets. Those industries with a large value of depreciable assets are, in turn, expected to benefit from accelerated

payable across broad industry groups for the 1996-97 tax year (as defined in ATO 1999, Ch 7, Table 4). The industry sectors that have the highest depreciation deductions are manufacturing, finance, communication and mining, although this reflects the size of the sectors as much as anything else. The largest beneficiaries relative to levels of taxation are the utilities,[9] communications, transport,

Table 2.1 Depreciation deductions and net company tax paid by sector (1996-97)

Sector	Depreciation deductions $m	Net company tax $m
Primary production	406	216
Mining	2,958	1,744
Manufacturing	5,550	3,054
Utilities	1,171	51
Construction	606	457
Wholesale trade	1,047	1,336
Retail trade	1,342	781
Accommodation, restaurants	423	158
Transport and storage	1,626	481
Communication	3,537	966
Finance, insurance, business services	5,061	7,903
Government, defence	3	10
Health and community services	229	174
Cultural, recreational services	536	420
Industry not stated	533	409
Total	25,027	18,160
Five largest depreciation industries	18,731	14,148
Manu, Fin, Com, Min, Trans	(74.8%)	(77.9%)
Five largest net tax industries	18,153	15,003
Fin, Manu, Min, Whole, Trans	(72.5%)	(82.6%)
Five high depr, low tax	7,162	1,872
Util, Prim, Trans, Comm, Accom	(28.6%)	(10.3%)
Five high tax, low depr	7,180	10,078
Gov, Fin, Whole, Rec, NS	(28.7%)	(55.5%)

Note: Figures in parentheses represent shares of total depreciation deductions and net tax.

Source: ATO 1999, Ch. 7, Table 4

depreciation and to suffer from its abolition, although this also depends on the types of assets eligible for accelerated depreciation.

[9] Net tax levels are particularly low in this sector, a feature that can be explained in a number of ways. Firstly, many utilities are still government owned. This means that in many cases distributions include some tax-equivalent payments, instead of income tax being recorded. Secondly, electricity utilities in both public and private hands are experiencing very narrow margins as a result of deregulation. This will also contribute to lower profits and tax liabilities.

accommodation, cafes and restaurants and primary production sectors. The subsectors within these broad industry groups can also be examined (ATO 1999). Those that benefit especially from depreciation allowances include: electricity utilities; forestry and logging, cattle farming and other livestock farming; road passenger, air and rail transport; telecommunications; and, hotels and clubs. There are similar sub-industries within manufacturing (e.g. textile fibre, petroleum refining, ceramic products) and finance.

Table 2.1 identifies the industries that claim most in depreciation deductions. It would be incorrect to suppose that these are necessarily the same industries that benefit most from accelerated depreciation. For example, in the early 1980s the Bureau of Industry Economics argued that the depreciation system favoured mining and agriculture over manufacturing investment (BIE 1982, Attach. 1 p. 36). However, recent changes to the depreciation treatment of machinery and industrial buildings may have altered this balance (Pender and Ross 1995, p. 9-11). Table 2.1 seeks to provide a guide as to the industries likely to benefit most from accelerated depreciation. An industry able to claim large depreciation deductions is more likely to benefit from accelerated depreciation.

2.3 Environmental implications of accelerated depreciation

From an environmental perspective there may be strong grounds for the retention of accelerated depreciation. Accelerated depreciation encourages faster replacement of older equipment and makes the commercial application of new technology more viable. Many renewable energy sources and most pollution prevention equipment rely on such new technologies. Furthermore, accelerated depreciation makes investment in energy efficiency more attractive, a particularly important factor since such investments are seen as 'non-core' by many businesses and must therefore yield higher rates of return to be undertaken. On the other hand, the current depreciation regime is designed to favour certain resource-intensive activities such as fossil fuel electricity generation, mining and forestry thereby providing perverse incentives that contribute to environmental degradation. As illustrated in Appendix 1, these activities enjoy shorter write-down periods.

The Ralph review explores a number of options for the reform of depreciation. These include retention of the existing system, changing to effective life treatment and changing to effective life with a 20% or 50% loading to remove distortions in the current system (Treasury 1999, p. 122-3).[10] Effective life treatment with a loading may have some advantages in that it treats all investments equally, thereby removing some of the additional incentives provided to certain environmentally-damaging activities.

2.4 Sectoral impacts of the proposed tax changes

The Ralph review's terms of reference directed it to examine various reforms to the taxation of investment with the aim of moving towards a company tax rate of 30% whilst maintaining revenue neutrality (Treasury 1999, p. 63).

[10] A loading enables an additional deduction to be claimed. For example, a 50% loading enables 150% of effective-life depreciation to be claimed, shortening the period of depreciation by one-third.

One of the main proposals put forward by the Ralph review 'Platform for Discussion' is a reduction in company tax from 36% to 30%, with the loss of revenue being offset by the removal of accelerated depreciation and other capital write-off provisions. Estimates put forward by the review suggest that reducing the company tax rate would cost $3.1 billion in forgone revenue by 2003-04 (Treasury 1999, p. 801), rising to $4 billion by 2009-10 (Ralph Secretariat cited in *Australian Financial Review* 28 April 1999).

As discussed earlier, removing accelerated depreciation is expected to net the government an additional $2.4 billion in 2003-04. Longer run estimates of the revenue gain are sensitive to the rate of growth of investment and the distribution of this investment amongst assets with various effective lives (Treasury 1999, p. 803). However, it has been suggested that the revenue from removing accelerated depreciation will stabilise at around $2.5 billion (Ralph Secretariat cited in *Australian Financial Review* 28 April 1999), which seems surprising since this revenue should grow at a similar rate to investment in depreciating assets.

The company tax rate-accelerated depreciation swap

Reducing the company tax rate will benefit all companies that pay tax. Removing accelerated depreciation will disadvantage capital-intensive companies that pay tax. Companies making losses for tax purposes will generally be no better or worse off under these proposals, unless removal of accelerated depreciation moves them from loss to profit for tax purposes. The Ralph review did not identify winners and losers from the trade-off, although revenue neutrality ensures that company tax reform is a zero-sum game.[11]

So which industries benefit? To answer this question, different industry sectors can again be compared in terms of the amount of depreciation they claim and the net tax they pay. This information appears in Table 2.1 above. In absolute terms, the finance, insurance and business services sector, the communications sector, the wholesale trade sector, as well as mining and manufacturing pay the largest proportion of total tax revenue between them (83%). However, as discussed above four of these five sectors are also among the top five sectors benefiting from depreciation (and, although it is not known with any certainty, probably accelerated depreciation).

In relative terms, those companies with high depreciation deductions as a proportion of company tax payable have been identified in the discussion of accelerated depreciation. These industries will benefit least from the proposed tax trade-off. Conversely, those companies with little depreciation, and high levels of tax payable – namely those in the business services, wholesale trade, cultural and recreational services and health and community services sectors – stand to benefit the most from the proposed trade-off. The proportion of depreciation deductions attributable to accelerated depreciation varies from industry to industry and little information is available as to these proportions. Table 2.2 reports the change in company tax payable in each industry sector, comparing it with the size of depreciation deductions. This information is presented for the purpose of identifying broad winners and losers from the corporate tax-accelerated depreciation trade-off.

[11] The loss of government revenue from reducing the business taxation rate is, however, projected to exceed the revenue gains from the abolition of accelerated depreciation.

Table 2.2 Sectoral impact of an accelerated depreciation-company tax swap (1996-97 figures)

	Company tax @ 36% 1996-97 $m	Company tax @ 30% (notional)[a] $m	Reduction in company tax $m	Depreciation deductions 1996-97 $m
Primary production	216	180	36	406
Mining	1,744	1,454	291	2,958
Manufacturing	3,054	2,545	509	5,550
Utilities[b]	51	42	8	1,171
Construction	457	381	76	606
Wholesale trade	1,336	1,114	223	1,047
Retail trade	781	651	130	1,342
Accommodation, rest.	158	132	26	423
Transport and storage	481	401	80	1,626
Communication	966	805	161	3,537
Finance, bus. serv.	7,903	6,585	1,317	5,061
Govt, defence	10	9	2	3
Health, comm. serv.	174	145	29	229
Cultural, rec. serv.	420	350	70	536
Industry not stated	409	341	68	533
Commercial[c]	11,748	9,790	1,958	12,178
Total	18,160	15,134	3,027	25,027

a. This column is presented on the basis that the tax base is unchanged. Accordingly, it represents the impact of changing the company tax rate but not the impact of removing accelerated depreciation. The final column presents depreciation deductions for comparison.
b. This sector has an unusually low company tax liability. This reflects the fact that income tax-equivalent dividend payments are not incorporated in the taxation statistics for this sector. Energy market deregulation and low margins may have also contributed to low company tax liabilities in this sector. However, it is still likely that this sector will experience a relatively small decrease in company tax and may well lose substantial depreciation deductions.
c. Commercial being the aggregate of Wholesale and Retail trade, Accommodation, Communication, Government, Finance, Cultural and Health Industries.

Source: ATO 1999, Ch. 7, Table 4

The table indicates that the proposed trade-off will in all likelihood result in a net transfer from the low-tax, high depreciation sectors (utilities, transport and communication as identified in Table 2.1) to the finance and business services and wholesale trade sectors. Other sectors may also be affected. For example, protests from mining and manufacturing industry groups suggest that these sectors may suffer more than indicated by a simple comparison of total depreciation deductions (as in Table 2.1 and 2.2). Other measures proposed in the Ralph review process may also be to the detriment of specific industries.[12] For example, removal of the transfer of mining losses is anticipated to cost the mining industry a further $40 million in 2003-04, based on the anticipated revenue gains from this measure (Treasury 1999, p. 801).

[12] Other areas include reforms to leases and rights, other capital write-offs and other provisions.

Although these other measures will affect the relative industry impacts of the Ralph proposals as a whole, they are not discussed further.

2.5 Economic impact of the proposed changes

Changing the company tax rate and treatment of depreciation deductions is likely to change the rate of return on investment in different industry sectors. Accordingly, a shift in investment could be expected to occur. Changes to accelerated depreciation will make investment returns on depreciating assets less attractive than investment returns on non-depreciating investments. This may encourage investment in assets that contribute less to the economic growth, reducing investment in new capital equipment and technology.

There may be some economic basis for reforming the current depreciation system. The current system was designed to favour certain industries that were deemed important to Australia's economic development. It may now be appropriate for a more modern, diversified economy to institute a 'level playing field' when it comes to industry assistance in the form of favourable depreciation treatment. For example, special depreciation allowances available to the mining industry may constitute an inefficient and anti-competitive subsidy.

Competitiveness of the taxation system

The 'international competitiveness' of the taxation system is said to be an important issue in reform, although too much emphasis is often given to this aspect of taxation. Much of the focus has been on company tax rates and capital gains tax rates. However, it also is worth considering the tax treatment of capital assets (other than for capital gains) in Australia relative to our trade competitors. A comparison of company tax and depreciation rates for Australia and major trading partners is presented in Appendix 2. This appendix shows that treatment of depreciation in Australia is similar to other OECD and Asian economies. However, there is some evidence that particular industries benefit from special treatment in other countries. For example, Chile, Argentina and Indonesia provide more favourable treatment to the mining industry than Australia does (Pricewaterhouse Coopers cited in *Australian Financial Review* 8 March 1999). Any reduction in the depreciation rates may render Australia relatively less attractive for capital-intensive investment. However, other aspects of business taxation may be more important.

2.6 Payroll taxes

Payroll tax is the largest source of state revenue,[13] although it has been almost completely ignored in the current round of tax reforms. Because payroll tax is 'applied or capable of being applied to a broad base' (ANTS 1998) the Howard Government has indicated that any reform is a low priority. Industry groups, on the other hand, argue that distortions are created by the way payroll tax is levied (DEWRSB 1999). Payroll tax discriminates against large employers and places a larger burden on labour-intensive industries. As such, it increases the cost of labour inputs to a business relative to materials and capital. Conventional economic logic would suggest that (other things being equal) payroll tax has the effect of reducing

[13] Payroll tax will remain one of the few state taxes after the phasing in of the GST package.

employment by shifting activity towards materials- and capital-intensive activity. It also encourages structuring of businesses so that individual companies have payrolls below the threshold, thus encouraging out-sourcing.

Payroll tax is levied on the annual payroll of employers. When the total taxable wages paid by an employer exceed a certain threshold, payroll tax accrues. The thresholds vary from state to state, from $456,000 in South Australia to $850,000 in Queensland.[14] Raising these thresholds is strongly advocated by small and medium business (DEWRSB 1999). Above these thresholds payroll tax is charged at varying rates – ranging from 5% in Queensland to 6.85% in NSW. In 1996-97, States and Territories collected around $8 billion in revenue from payroll taxes (ABS 1998). Table 2.3 compares company tax liability and payroll tax liability across different industry sectors including the proportion of total tax payments represented by payroll taxes.

The last column of Table 2.3 shows the share of payroll tax in company plus payroll tax. The variations in shares reflect three major factors: the capital *versus* labour intensity of production, the share of small firms in each sector and the influence of

Table 2.3 Payroll and company taxes across industry sectors

Sector	Company tax $m	Payroll Tax $m	Company Plus payroll $m	Proportion payroll %
Primary production[a]	216	–[a]	216	na[a]
Mining	1,744	301	2,046	15
Manufacturing	3,054	1,708	4,762	36
Utilities	51[b]	176	227	78[b]
Construction	457	274	731	38
Wholesale trade	1,336	683	2,019	34
Retail trade	781	606	1,387	44
Accomm. etc.	158	199	357	56
Transport and storage	481	579	1,060	55
Communication	966	366	1,331	27
Finance, business etc.	7,903	1,438	9,341	15
Government, defence	10	227	237	96
Health, comm. serv.	174	1,026	1,200	86
Cultural, rec. serv.	420	491	911	54
Industry not stated	409[c]	–	409	0[c]
Commercial	11,748	5,035	16,783	30
Total	18,160	8,074	26,235	31

a. Statistics on primary production are not collected by the ABS, and are not provided in state financial records.
b. Estimates of company tax for this sector do not include tax-equivalent dividend payments.
c. Industry not stated category is not consistent for payroll tax and company tax statistics.

Source: ATO 1999, Ch. 7, Table 4; ABS 1998

[14] The threshold is phased out at higher payrolls. For example, in Queensland the threshold is reduced by $1 for every $3 of wages above $850,000.

public ownership on company tax payments. Surprisingly, sectors such as finance and business services pay a relatively small proportion of their total taxes as payroll tax, perhaps reflecting a large number of small firms.[15] Not surprisingly, mining paid relatively little payroll tax, due principally to the lower labour-intensity of the industry sector. Primary production must be excluded from this analysis because payroll tax liability data are not readily available for this sector.[16] The two sectors with the largest company tax liability, manufacturing and financial and business services, also have the largest payroll tax liabilities. In addition, the health services sector has a large payroll tax liability. Because a large part of the health and education subsectors included in this industry are publicly owned and operated, it is not surprising that taxable incomes are small compared to payroll tax liability. It is also important to note that this sector also includes non-company entities (not shown in the table) that are not liable for company tax.

2.7 Concluding comments

The analysis of this section, although indicative only, suggests that abolition of accelerated depreciation and reducing the company tax rate will strongly favour some parts of the services sectors, especially finance, insurance, real estate and business services, and retail trade. This will be at the expense of capital-intensive sectors, notably communication, transport and storage, accommodation and restaurants and possibly utilities. Mining and manufacturing currently receive large benefits from depreciation deductions, and probably accelerated depreciation. However, they also pay a large amount of company tax. The increased tax liability that these sectors would sustain as a result of the abolition of accelerated depreciation is offset, to a certain extent, by a reduction in the company tax rate. However, this analysis is unable to determine the size of any shortfall. Subsectors within the mining and manufacturing industries will be affected differently, as will specific projects and businesses. How this affects the competitiveness of Australian manufacturing and mining industries is a different matter. A number of groups have argued that some mining projects may not be profitable with the loss of accelerated depreciation (Goldsmith cited in *Australian Financial Review*, 8 March 1999).

The Ralph review does not analyse the sectoral impact of replacing accelerated depreciation with a lower company tax rate. In addition, the review provides no rationale for abolishing accelerated depreciation, but provides strong reasons for its retention in terms of encouraging investment, ensuring a faster turnover of the capital stock and maintaining international competitiveness (Treasury 1999, p. 119-122). The review does highlight many of the distortionary features of the current system, and recommends simplifying the treatment of different classes of investment (Treasury 1999, p. 122).

One major tax, payroll tax, has not been considered by the Ralph review. Payroll tax places a significant burden on many sectors of the economy and is levied in such a

[15] This ignores other taxes, such as fringe benefits tax, stamp duties etc.

[16] In addition, many primary production businesses are unincorporated and are organised in such a way as to have low labour costs – for example, family farms.

way that it may distort production decisions. In addition, payroll tax increases labour costs, thereby increasing the costs of creating and sustaining employment.

3. Australia's emission reduction obligations and emissions trading

3.1 The Kyoto target

The Kyoto Protocol to the Framework Convention on Climate Change (FCCC) agreed in December 1997 imposes a legally binding obligation on Australia to limit the growth of greenhouse gas emissions. Australia is committed to restricting total emissions to an average of 8% above 1990 levels in the commitment period 2008-2012. In other words, annual emissions over the commitment period must average no more than 108% of total emissions in 1990, the base year. Although the target appears straightforward there are a number of complicating issues, notably with respect to the role of emissions from land clearing, carbon sinks and the role of 'flexibility mechanisms' permitted under the Protocol (including joint implementation, the Clean Development Mechanism and emissions trading).

The path of emissions from land clearing in Australia will have a significant bearing on the emissions target for fossil fuel consumption.[17] Article 3.7 of the Kyoto Protocol includes a clause (known as the 'Australia clause') that permits countries for which land-use change and forestry are a net source of greenhouse gas emissions to include net emissions from land-use change in their 1990 base year for the purpose of calculating assigned amounts (targets) for the commitment period 2008-2012. The effect of the inclusion of the Australia clause is to increase Australia's 1990 baseline substantially because of the high level of emissions from land clearing in that year. Thus if emissions from land clearing decline from their 1990 levels, emissions from fossil fuel combustion will be able to increase by more than 8% while Australia still meets its overall commitment.

Emissions for each year from 1990 to 1996 by sector are shown in Table 3.1. These data are derived from Australia's official national greenhouse gas inventory released in October 1998.[18] It is apparent that, according to the official inventory, emissions from land-use change in the 1990 base year were 89.8 Mt or 18.9% of Australia's total comprehensive emissions. By 1996 this had declined to 62.8 Mt, probably as a result of the falling profitability of land clearing for cattle grazing. Since emissions from land-use change comprise a large share of 1990 base year emissions, the path of emissions from land-use change between 1990 and 2008-2012 will have a major bearing on permitted emissions from fossil fuel combustion.

Hamilton and Vellen (1999) consider two scenarios, one that assumes that the rate of land clearing does not change from the rate prevailing in 1996, and one that assumes that the Australian Government implements its announced plan to cut land clearing by 20 000 ha/annum starting in the year 2000. Under the first scenario, Australia's fossil energy (and other non-land-use) emissions can increase by 20% by 2008-2012 while

[17] The issue is explained in detail in Hamilton and Vellen (1999).

[18] Some more recent estimates of areas of land cleared have been made by the Bureau of Rural Sciences (1999). The more recent estimates do not report land clearing for each year since 1990, but only a five-year average. The area of land cleared averaged 309,000 ha/annum over the period 1990-1995, compared to an average rate of land clearing implied in the estimates of emissions in Table 3.1 of 396,000 ha/annum. In order to understand how rates of land clearing affect Australia's target we need to know the 1990 base year emissions and changes in emissions from land clearing since then.

Table 3.1 Emissions by sector and comprehensive emissions, Australia 1990-1996 (Mt CO_2-e)

	1990	1991	1992	1993	1994	1995	1996
Total comprehensive emissions	474.5	467.8	464.9	465.5	461.4	472.6	482.1
Total comprehensive emissions less Forestry and other	500.1	493.0	490.5	491.1	485.7	496.0	504.8
Energy	296.7	298.4	302.4	305.1	308.6	321.3	331.8
Industrial processes	12.1	11.7	10.4	10.2	9.9	9.0	9.2
Waste	14.8	15.1	15.4	15.8	16.1	16.3	16.7
Agriculture	86.7	86.9	85.0	85.2	84.5	84.9	84.3
LUCF (total net)	64.3	55.6	51.6	49.3	42.3	41.1	40.2
LUC (net)	89.8	80.7	77.2	74.9	66.6	64.5	62.8
Forestry and 'other' (net)	-25.6	-25.2	-25.6	-25.6	-24.3	-23.4	-22.7

Source: Hamilton and Vellen 1999, Table 3. This table corrects a minor error in Hamilton and Vellen where non-CO_2 emissions in the 'other' component of LUCF were omitted.

Australia still meets its overall Kyoto target of 108%. Under the second scenario, fossil emissions will be able to increase by 26% by 2008-2010.

While emissions from fossil fuel combustion in the 1990 base year are known with some certainty, considerable uncertainty remains attached to estimates of emissions from land use change, as well as from forestry and agriculture. As a result, the target level of emissions from fossil fuel combustion remains uncertain and, in our view, it would be prudent to adopt the lower of the estimates calculated above, i.e. 120%. Since much more stringent targets are likely to be negotiated for the subsequent commitment period (which might cover the years around 2020), nations which develop extensive renewable energy and energy efficiency industries will be in a stronger position. It may therefore be more sensible for the Federal Government to adopt a target of 108% for fossil emissions, the level that Australian industry believes is required. As will be explained below, if this means that Australia undershoots its target then surplus emissions can be traded on the international market.

Figure 3.1 illustrates the sources of 1997-98 emissions from fuel combustion by activity and final energy use. The first pie-chart indicates the primary source of emissions – that is, where they are actually generated. The second pie-chart allocates emissions from electricity to the sectors that use electricity, including the residential sector. This illustrates which industries are responsible for creating electricity emissions. The third pie-chart allocates emissions from road transport to private and own-business use. This leaves only the 'hire and reward' transport sector as separate. This approach is designed to show exactly which industries are responsible for which emissions. The second and third charts may be more useful in identifying priority areas for greenhouse abatement strategies.

3.2 Growth of emissions and the need to act

All current indications suggest that Australia will not meet its obligations under the Kyoto Protocol. The policies currently in place are unlikely to restrain fossil emissions even to 120% of their 1990 levels. The National Greenhouse Strategy describes a large number of measures, some of which will help slow the growth of

Figure 3.1 Source of emissions from energy 1997-98

Chart 1: CO_2 emissions at source 1997-98

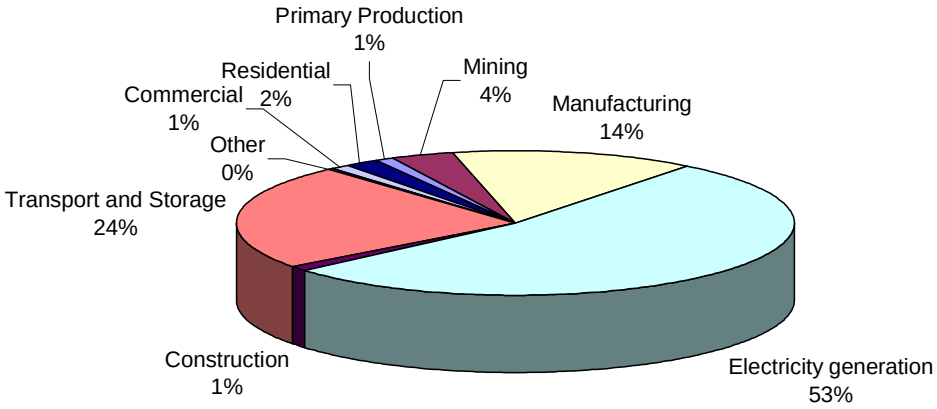


Chart 2: Allocating emissions from electricity

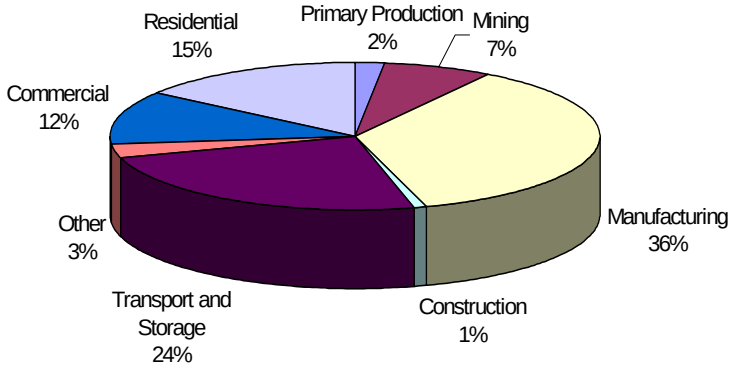
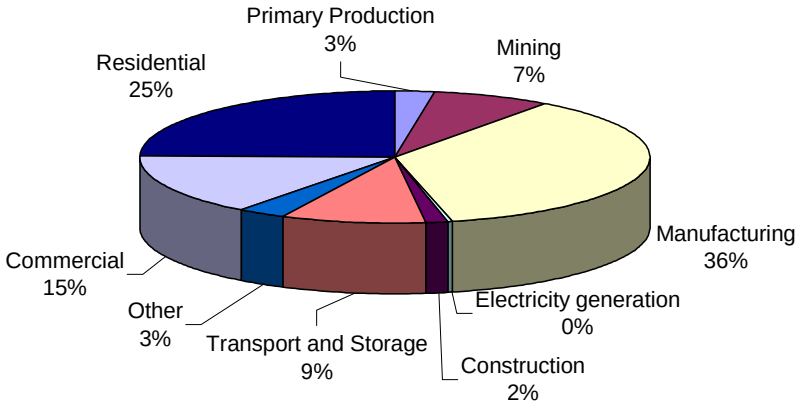
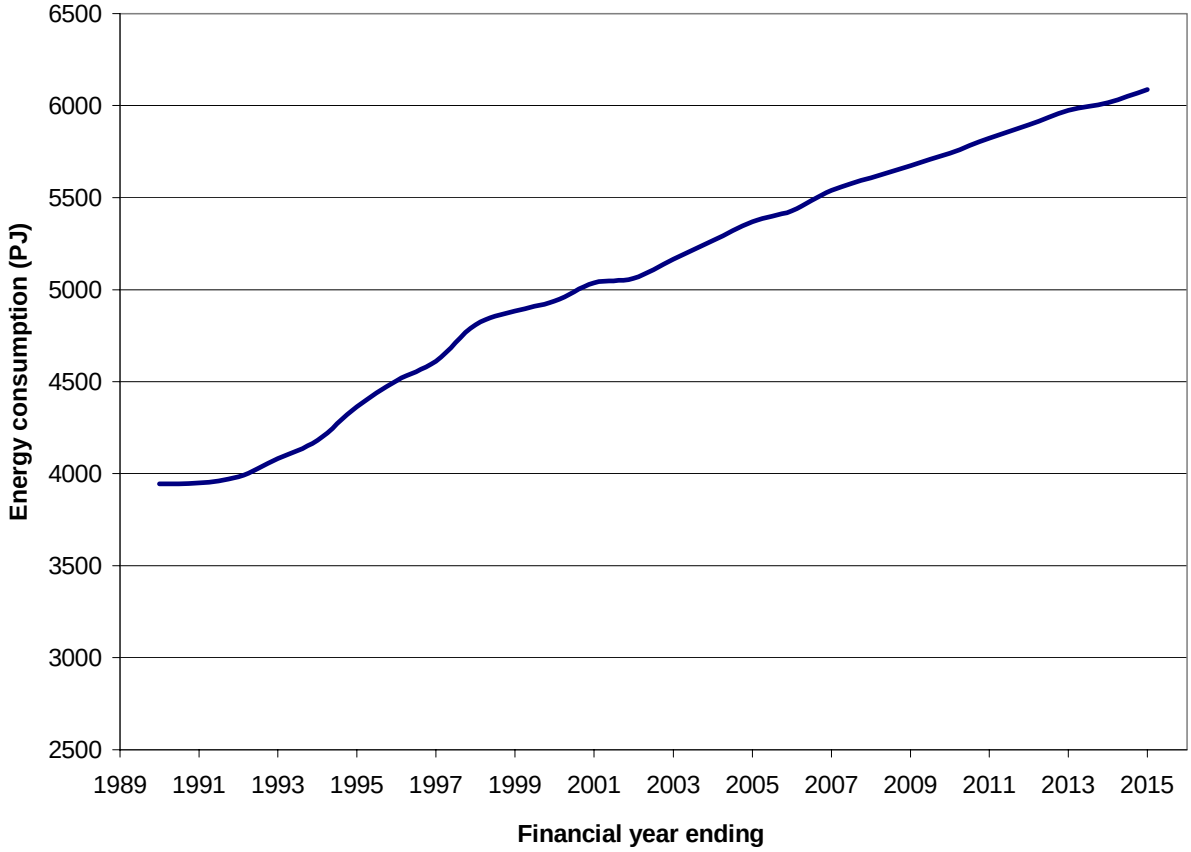


Chart 3: Allocating electricity and transport emissions



Source: Derived from ABARE 1999, p. 107; AUSTROADS 1999, p. 42; NGGIC 1998, p. 54

Figure 3.2 ABARE energy use and projections for 1990-2015



Source: Bush *et al.* 1999, Table B1

emissions. However, most activities are voluntary or rely solely on the dissemination of information, and almost none actually apply restrictions on emitting activities. The only significant mandatory policies are the requirement that electricity retailers use an additional 2% of electricity from renewable sources and minimum energy performance standards for appliances and buildings. It is expected that the 2% renewables policy will reduce emissions by 5.5 million tonnes below the levels otherwise attained, or around 1% of the total (ACIL 1998, p. vii; NGGIC 1997).

Australia's fossil emissions are growing rapidly. Between 1990 and 1996 they grew by almost 9% and will reach around 112% of 1990 levels by end 1999 (Bush *et al.* 1999). According to recent projections by ABARE, fossil emissions from energy are expected to grow to 140% of their 1990 levels by 2010 (Figure 3.2). At this rate, Australia will overshoot even the most generous estimate of its Kyoto target after taking account of the declining emissions from land-clearing.

Australia has now reached the point where it must decide whether it intends to meet its emission reduction obligations under the Kyoto Protocol or to accept the consequences of failing to do so. We are almost at the half-way mark between the base year and the middle of the commitment period in 2010, and energy emissions growth has shown no signs of slowing, let alone reversing. Moreover, the policies currently in place are wholly inadequate to reduce emissions to even 120% of 1990 levels.

The Kyoto Protocol requires each Annex B party, including Australia, to have made 'demonstrable progress in achieving its commitments' by the year 2005 (Article 3.2). In the same year the parties will begin consideration of commitments for the second commitment period (Article 3.9). Countries which cannot demonstrate progress in reaching their targets for the first commitment period are unlikely to receive sympathetic consideration when targets for the second commitment period are negotiated. In addition, the compliance mechanisms of the Protocol (Article 18) are now receiving attention. At the meeting of the subsidiary bodies of the FCCC in Bonn in June 1999 a number of non-compliance consequences were considered by the Joint Working Group on Compliance. They ranged from 'appropriate assistance' and cautions, to suspension of rights (including the ability to engage in emissions trading and the Clean Development Mechanism) and financial penalties.[19]

3.3 Emissions trading: international situation

By imposing legally binding obligations to restrict greenhouse gas emissions in Annex B countries (OECD countries plus economies in transition), the Kyoto Protocol was an exercise in the allocation of property rights. Prior to Kyoto, because rights were undefined, polluters had an unfettered right to emit.[20] The Protocol defined and assigned the rights to emit but imposed limits on those rights.

Under the Kyoto Protocol Annex B parties have been allocated 'assigned amounts' of greenhouse gas emissions. If a nation falls below its assigned amount of emissions in the 2008-2012 commitment period it may sell its surplus amounts to another party, and a party that exceeds its assigned amount may buy the difference from other parties.[21] However, the Protocol states that inter-country emission trading should be 'supplemental' to domestic actions to reduce emissions. These domestic actions can include domestic emissions trading systems.

The emergence of a market for trading in emission permits depends in the first instance on the imposition on polluters of legally binding obligations to constrain emissions. This is what the Protocol does. While the Kyoto Protocol endorsed emissions trading in principle, many structural issues of the international system are still to be resolved.

It is conceivable that participating governments could establish emission trading agencies to trade surpluses and shortfalls in assigned amounts – hereafter referred to

[19] See *Earth Negotiations Bulletin*, Vol. 12 No. 105, 7 June 1999.

[20] This 'right' to emit is a legal one. Some people would argue that while polluters may have had an unrestricted legal right to pollute, they did not have an unrestricted moral right to pollute. The distinction between legal and moral rights explains why many environmentalists object to emissions trading, for it seems to confer a moral right to pollute, even though it restricts the legal right to pollute. While there is some force to this argument, in the end the limitation of emissions should be the dominating objective. It is also worth noting that the Kyoto Protocol has vested the rights with the governments of the Annex B parties. Since governments are merely constituted institutions rather than physical actors, and as such are not capable of polluting, they must now choose either to give these rights to domestic polluters (formally or otherwise) or require them to buy the rights through an auction. The AGO (1999a, p. 2) notes a recommendation that emission permits be regarded as licences to emit rather than property rights.

[21] Note that the Kyoto Protocol specified targets for a five-year commitment period, 2008-2012, rather than a single year, 2010, so that averaging eliminates the incidence of non-compliance arising from unexpected fluctuations in emissions.

as 'emission permits' – between countries for the purpose of meeting their obligations. However, the system will work much more effectively if individual polluters (electricity plants, steel plants etc.) are given the flexibility that trading allows. The Protocol allows for this. Thus the development of effective international emissions trading is dependent on national governments imposing legally binding constraints on emitting activities within their national boundaries and providing the legal framework in which emitters have the option to meet these emission obligations through emissions trading. In other words, both the legal obligations and the emission rights agreed to by nations at Kyoto now need to be transferred to domestic polluters through domestic legislation establishing emission caps and the rights and institutions that a system of domestic emissions trading requires.

In addition to assigned amounts, allocated at Kyoto, there are two means by which emission permits may be generated.[22]

1. The Protocol adopts a *net* approach to emissions obligations, one that allows for the establishment of new emission sinks that may offset emission sources. Under certain conditions (still to be determined) the establishment of these sinks will attract additional emission permits that can be used to meet domestic (and international) emission reduction obligations.

2. Article 12 of the Protocol establishes the Clean Development Mechanism (CDM) which allows Annex 1 Parties and private entities within them to acquire certified emission reductions (CERs) by investing in projects in developing countries. These CERs can be used by Annex B Parties to meet their emission obligations under the Protocol.

3.4 Emissions trading: Federal Government position

The Federal Government strongly supported the inclusion of emissions trading in the Kyoto Protocol and has opposed recent European moves to place limits on the ability of parties to meet their obligations through international emissions trading. It has also expressed interest in developing a domestic greenhouse gas emissions trading system. ABARE has been a strong advocate of emissions trading for some years. Tony Beck, formerly of the Australian Industry Greenhouse Network, has recently noted that countries such as Canada, Norway, Denmark and New Zealand are well ahead of Australia in making a commitment to domestic trading and that 'the alternatives are pretty obviously less palatable'.[23] The chief alternative is a carbon tax.

From a fiscal standpoint, a carbon tax would be superior to emissions trading. The revenue that could be raised from a carbon taxes would be more certain than that from auctioning emission permits since the price per tonne of carbon is fixed. However, a carbon tax would be a less reliable means of reaching a given emissions target, a target that has now been fixed for Australia by the Kyoto Protocol and formally

[22] There is a third flexibility mechanism, joint implementation generating emission reduction units as a result of investments by Annex B countries in other Annex B countries. However, it is not clear how this mechanism would work when emissions trading is also permitted. One view is that the provision was left in the protocol as an alternative to emissions trading when the inclusion of the latter was uncertain. In the absence of emissions trading, joint implementation would be a very important flexibility mechanism, and much easier to administer than CDM.

[23] Quoted in *Environmental Manager* Newsletter Issue No 247, 11 May 1999.

adopted by the Federal Government. A carbon tax also has the advantage of administrative ease, but the emissions trading scheme put forward in Section 4 is designed for maximum simplicity while still achieving broad coverage of emissions. The advantage of trading over a carbon tax is that it assures a specified emissions outcome.

A domestic emissions trading system would provide an effective policy for limiting emissions so that Australia can meet its obligations under the Kyoto Protocol. It would also provide Australian-based firms with a 'first-mover advantage' when the international emissions trading system begins to operate. Economic transitions involving structural change are costly, and uncertainty and delay increase these costs. In the words of Treasury's Jim Hagan:

> the earlier that uncertainty concerning the future evolution of emissions reduction can be reduced, the greater the time, and the lower the cost, for an economy's transition to the commitment period (Hagan 1998, p. 65).

The more time firms have to replace capital equipment and redesign products, the lower their costs will be. The Australian Greenhouse Office (AGO) concurs: '…delaying action…might mean absorbing more rapid and costly levels of industry adjustment in the future' (AGO 1999b, p. 11). There is therefore a strong imperative for the Federal Government to introduce measures now to ensure that Australia meets its target.

In March 1999 the AGO, which has carriage of climate change policy, issued the first of four planned discussion papers on emissions trading (AGO 1999a). It considered issues of coverage and the basic structure of a national emissions trading system. The second report, released in June 1999, considered methods of permit allocation and their implications in some detail. Subsequent reports will consider the role of carbon credits (sinks), and details of implementation.

The next section describes a system of emissions trading appropriate for Australia. It is important to point out that while the development of a domestic emissions trading system in Australia should be made compatible, as far as possible, with the expected international system, it is not dependent on the latter. Moreover, while emissions trading under the Kyoto Protocol is relevant for meeting emissions targets only in the commitment period 2008-2012, the domestic emissions trading system described next would apply from the year 2001 through to 2012 in the first instance. Its purpose is to provide an effective domestic policy tool to bring Australia's emissions down to the level of our assigned amount so that Australia complies with its international obligations in the commitment period. It will also serve as a substantial source of revenue for the Federal Government and therefore has direct bearing on the structure of business taxation now under review.

4. The proposed emissions trading scheme

4.1 Overview

The scheme proposed here is a 'cap-and-trade' system in which major emitters would be limited by legislation in the amount of greenhouse gases they can emit through the issuing of permits to emit. It would cover CO_2 emissions from all fossil fuel combustion. Financial penalties would be imposed on entities that emitted greenhouse gases without sufficient permits. Emission permits would be issued by the federal government and would take the form of the right to emit a tonne of carbon dioxide in a specified year.[24] An entity that holds a permit may choose to acquit it against its own emissions or sell it to another entity. The permits would be allocated by an auctioning process. It is proposed that the scheme begins in the year 2001 and runs through at least until 2012, the end of the current commitment period under the Kyoto Protocol. In sum, the scheme proposed here is a domestic upstream cap-and-trade system with full auctioning of permits. These issues are elaborated below.

4.2 The trading system

There are two basic types of emission trading system – cap-and-trade and baseline-and-credit. The former imposes an overall cap on emissions for a given period, creates the implied number of emission permits and allocates them by some means to polluters who are legislatively included in the system. The baseline-and-credit system defines a baseline of emissions over time for each defined polluter so that the overall emission limitations requirement is met. Emission credits are generated only by reducing emissions below the specified baseline. Polluters may not exceed their defined emissions limit unless they purchase emission credits from another polluter that has reduced emissions below its baseline level. Thus the tradeable instrument is only created by deviations from the baseline.

There are several strong arguments in favour of the cap-and-trade with auctions system. Firstly, since all polluters must purchase permits for all of their emissions there are no distortions introduced into the economy as a result of free allocation of permits up to baseline levels that are determined by historical accident. Furthermore, it is consistent with the user-pays principle in which the external costs of polluting activities are met by the polluter. Thirdly, new entrants suffer no disadvantage as they must pay the same price for a permit to emit as existing firms. Under the baseline-and-credit scheme, existing firms are effectively given emission permits up to their historical levels. Finally, a system of cap-and trade with auctions generates a significant amount of public revenue by taxing polluters, revenue that can be used to lower other business taxes thereby eliminating the disadvantage for low-polluting firms embedded in the existing tax system.

[24] Strictly speaking, the upstream approach favoured here would require the acquittal of permits to sell fossil fuels that will result in emissions rather than acquittal to emit the greenhouse gases associated with combustion of the fossil fuels.

4.3 The upstream approach

One of the first issues to be decided in any trading scheme is which entities are to have legislative limits placed on their emissions. One of the difficulties with a system that limits emissions is that there is a very large number of sources. While there are only a few sources of emissions in the electricity sector, there are millions of households burning gas and millions of vehicles in the transportation sector. It is not feasible to require each household and motorist to purchase an emission permit to cover each year's emissions.

One solution to this dilemma is to adopt an 'upstream approach'. This approach is outlined in the first AGO paper (1999a) and discussed in detail in a paper by the Washington-based Center for Clean Air Policy (CCAP 1998). Under the upstream cap-and-trade system, caps are imposed not on emitters but on the suppliers of fossil fuels that, when burnt, result in emissions.[25] Upstream systems are possible because there is a well-defined relationship between the quantity of a fossil fuel burnt and the amount of CO_2 released.[26] Like all emissions trading systems, coal and oil would be disadvantaged compared to natural gas, because they are responsible for more emissions per unit of energy delivered, and all fossil fuels would be disadvantaged compared to renewable energy sources.

The principal advantages of the upstream system are as follows.

1. It can cover all fossil fuel use and associated emissions. The CCAP (1998, p. 5) estimates that a downstream system would capture only about 50% of emissions. This would require another suite of policies aimed at limiting emissions that fall outside of the trading system. The environmental outcomes for these sectors would be less certain.

2. An upstream system is relatively easy to administer because the number of enterprises that must hold permits is much lower than a downstream system, perhaps fewer than 200 regulated enterprises (see below). This would have very large cost savings in monitoring, reporting and verifying.

The upstream approach suffers from one major drawback. By applying caps to fossil fuel producers or processors, the enterprises that actually generate the emissions through burning fossil fuels do not face quantitative limits directly but feel the effects of the trading system through price rises for fuels. While in principle the effect ought to be the same, in practice price rises as opposed to quantitative limits may influence behaviour differently.

> The drawback of a price signal relative to direct regulation is that due to market imperfections such as high transaction costs, high discount rates and imperfect information, some energy users do not respond to price signals (CCAP 1998, p. 7).

[25] As mentioned earlier and discussed in Section 4.4 this scheme would apply only to fossil fuel combustion.

[26] There is not a precise relationship between the volume of fossil fuel burnt and emissions of other GHGs. Emissions of methane (CH_4) and nitrous oxide (N_2O) depend on the combustion and pollution control technology employed. Fortunately, CH_4 and N_2O contribute 2% of total emissions (measured by GWP) from fossil fuel combustion (NGGIC 1998, p. xviii).

These problems of market signalling are likely to diminish over time as firms and final consumers become accustomed to the system. There is merit, therefore, in designing the system so that the effects of the cap are felt gradually over the first two to three years. On balance, however, the advantages of the upstream system in terms of coverage of emissions and administrative ease outweigh the potential disadvantages associated with incentive effects.

The upstream system would also need to take account of exports of fossil fuels (which would be exempt from caps) and non-combustion use of fossil fuels. It may also need to accommodate new technologies that treat end-use emissions, such as carbon dioxide scrubbers, although these are some way off commercially.

4.4 Coverage

The proposed system would cover all fossil fuels destined for combustion in Australia. It would not cover non-energy greenhouse gases from waste and agriculture. Nor would it apply to emissions from land-use change, although there is scope for including carbon sequestered in new plantations (see Section 4.6). Other policies are required to limit emissions in these sectors. The issue of new sinks is discussed below. Excluding emissions from land clearing, the system proposed here would cover emissions accounting for 72% of the total net emissions of all greenhouse gases in 1996.

In the upstream system outlined by the AGO, permits would be required by only approximately 260 sites producing coal, oil and gas (AGO 1999, p. 20). In the system proposed by the CCAP, emission permits would be required at the following points, with the approximate number of Australian entities shown in parentheses:

- petroleum refineries (8);
- major sea-board petroleum import terminals (3) in addition to the refineries;[27]
- natural gas processing plants (12), included because emissions from natural gas will all be captured;
- coal preparation plants (washeries) (10-20) since a large proportion of coal consumed in Australia passes through these plants; and
- coal mines (120) because some coal does not pass through coal preparation plants.

This indicates that there would be approximately 160 sites where permits would be required.

4.5 Banking and borrowing

The instrument to be traded is a permit to sell carbon fuels responsible for a tonne of carbon dioxide emissions in a specified year. Within the overall cap imposed on emissions, it is valuable to build flexibility into the system. The banking of emission

[27] *Pers. comm.* Australian Institute of Petroleum. In addition there are coastal terminals used for domestic petroleum transport. Some of these (such as those based in Darwin) may receive imports and will be required to hold permits.

permits, in which permits not acquitted in their year of validity may be held over and used in subsequent years, should be permitted. Depending on the length of time over which banking is permitted, banking will reduce fluctuations in the prices of permits. In the scheme proposed in the next section, the cap on emissions will not 'bite' for the first year or two of the scheme. Without the opportunity to bank permits, the price of permits in the first years would be very low and would rise steeply in later years.

The borrowing of emission permits, that is acquitting them in advance of the year of validity, is more of a problem. An entity may exceed its permitted emissions in one year through borrowing and then fail to reduce emissions by the amount 'owed' in future years. Whilst the firm would be penalised the cap will nevertheless have been exceeded. It may be feasible to permit borrowing but discount the permit to discourage the practice but still allow it as a last resort. Thus, for example, 5 tonnes of emissions in a given year could be acquitted by the use of 6 tonnes of permits valid in subsequent years.

4.6 Sinks

The Kyoto Protocol adopts a 'net approach' to measuring emissions in the commitment period. This permits the inclusion of carbon sequestered by certain types of forestry activities. While the precise definition of 'Kyoto forests' is the subject of intense debate among parties to the Convention, it is clear that emission credits can be generated only from forests planted after 1990 on land cleared before 1990. The carbon accounting associated with carbon sequestered in forests involves complex issues which are currently being reviewed by an expert body appointed by the Intergovernmental Panel on Climate Change (IPCC).

One critical issue which affects the commercial viability of forest sinks is the number of credits that can be generated from a given volume of forest biomass. Unlike the reduction of emissions from fossil fuels, which represent emissions saved permanently, carbon stored in forests is sooner or later released back into the atmosphere. Moreover, even if the timber from cut forests is converted into long-lasting products such as furniture, at least half of the biomass is lost either on the forest floor or in the form of sawdust and waste at sawmills.[28] In addition to carbon accounting, there are difficult issues associated with certification, auditing and liability that are yet to be resolved.

In Australia, there has been a great deal of interest in forest sinks from various groups – primary producers, electricity generators, financial intermediaries and state forest management agencies. Some people are entering into commercial arrangements expected to generate carbon credits without any assurance that the forest sinks in question will qualify under the rules being developed internationally under the Kyoto Protocol. In our view, these rules are likely to be restrictive and only large-scale

[28] Thus one proposal is that the annual carbon offset from a forest plantation be determined by the annual change in the stock of carbon stored multiplied by a factor calculated by dividing the average guaranteed duration of storage (including waste lost soon after harvest) by 100, where 100 is the number of years used by the IPCC to estimate the time over which thermal forcing occurs from additional CO_2 in the atmosphere. This would mean that the annual carbon storage in plantations would be multiplied by a factor of perhaps 0.2-0.3, and at the very most 0.5, to obtain the amount of carbon credits generated.

industrial plantations that can be unambiguously certified and audited over a long period will both qualify under the Protocol and be commercially viable.

In light of these considerations, while there is scope for inclusion of carbon sinks in the trading system proposed here, we have not incorporated estimates of the volume of emission credits that could be generated. Clearly, the greater the number of emission credits generated by forestry activities, the lower will be the price of emission permits. The marginal cost of forest plantations becomes an important market consideration.

4.7 Allocation of permits and export activities

When limits are placed on the right to emit, permits to emit become valuable. The increased prices of fossil fuels that would follow restrictions on the supply of permits will create rents, and the issue arises as to who should capture these rents. If permits are given away to polluters (or suppliers of fossil fuels) on the basis of historical levels (so-called grandfathering) this represents a wealth transfer from the public sector to the private sector. There are no equity or efficiency grounds to justify such a transfer – which, as we will see, would involve billions of dollars each year – and the appropriate procedure is to auction the permits among those required to hold them.[29] The revenue can then be used to reduce taxes elsewhere; if the other taxes are less efficient there will be a net welfare gain. Alternatively, the revenue from auctioning permits could be used to fund adjustment programs.

In some circumstances it may be deemed appropriate for adjustment costs to be borne by enterprises other than the polluter. In these cases there may be some scope for the partial allocation of emission permits on the basis of historical emissions (known as grandfathering), with the balance auctioned. To reduce distortions and inefficiencies created by grandfathering, any such system should be limited to a small proportion of permits and phased out over a relatively short period. Grandfathering also adds additional administrative and monitoring costs. These could be overcome somewhat by using information collected in the Greenhouse Challenge Program (GCP) as the basis for allocation.[30] In addition, this approach ensures participants in the GCP are rewarded for their co-operation, monitoring efforts and early action.

While the introduction of emissions trading will inevitably lead to structural change in the economy – the whole purpose is to reduce reliance on high-emission activities and to promote low-emission industries – ultimately the costs of emission reductions will be met largely by final consumers.

Another way of looking at the question of auctioning *versus* giving away permits is to recognise that the costs of adjustment to lower emission levels must be met somewhere. Giving away the permits essentially allows the costs of adjustment to be shifted away from emitting activities onto other parts of the economy (Hagan 1998, p. 62).

---

[29] Third parties may also be permitted to bid for permits to be subsequently sold on to entities with caps, or to be retired.

[30] The GCP will become obsolete after the introduction of emission allowance trading, at least in its current form.

However, there may be a welfare loss if exporting industries (or import-competing industries) face significantly higher input costs and lose market share as a result of the introduction of emissions trading. In Australia, the industries likely to be affected are energy-intensive exporters competing with producers in other countries that do not have similar policies to reduce emissions (i.e. non-Annex B countries, although for long-term investments the probability that non-Annex B countries will take on targets in subsequent commitment periods is a relevant consideration). The major sectors that fall into this category are alumina, aluminium, LNG and steel production. LNG, although produced using an energy-intensive liquefaction process, has the potential to replace more emission-intensive fuels worldwide. In such cases, it may be desirable to incorporate special transitional provisions to offset the costs of emission abatement and provide those firms most affected with a longer period over which to adjust. One method worthy of consideration would be for the federal government to make special grants to qualifying firms from the proceeds of the auctioning of permits or to allocate a tranche of permits free of charge.

4.8 International trading and credit for early action

The way in which an Australian emissions trading system interacts with the expected international system will affect the operation of the market for permits. There are two key issues. Firstly, it would make sense for the Australian trading system to adopt a system of permit design, allocation, and monitoring as conformable as possible with the one expected to emerge internationally so that permits acquired under the Australian system are tradeable internationally during the commitment period.

Secondly, while it is proposed that, in the first instance, the domestic system operate over the period 2001-2012, the international system of trading will operate only in the Kyoto Protocol commitment period of 2008-2012. This gives rise to a potential problem: while the system proposed here allows for banking of permits, so that unused permits valid for emissions in, say, 2005 can be used to acquit emissions in 2006 or later, banked Australian permits will not allow Australia to exceed its assigned amount (108%) in the commitment period.[31] The volume of permits issued for the years 2008-2012 cannot exceed 108% of 1990 emissions, and while permits generated from sink and CDM activities will allow an excess of emissions over 108%, surplus domestic permits from earlier years will not.

Rather than have two separated systems, one operating between 2001-2007 and one for 2008-2012, the solution to this problem is to reduce the volume of emission permits offered in the years of the commitment period by an amount equal to the number of permits banked from earlier years which are available for use in 2008-2012. This will allow pre-2008 permits to be banked for use in the commitment period thereby allowing Australian firms more flexibility in planning to meet their targets. By making the Australian permit system conform to the requirements of the Kyoto Protocol, the pre-2008 permits will be valid in Australia during the commitment period. However, the prices of pre-2008 permits will be influenced by world markets only in the unlikely event that the cost of an emission permit in Australia is expected to be lower than the world price.

[31] The Kyoto Protocol allows for permits unused in the first commitment period to banked for use in subsequent commitment periods.

The system as proposed would give full credit to Australian firms for early action to reduce emissions without compromising Australia's commitment under the Protocol.

There may be a concern that a large volume of permits will be banked, thereby severely restricting the number of permits offered in the commitment period. However, given the profile of emission reductions required by the availability of permits for the period 2001-2007 (see next section), and the fact that banked credits may be acquitted in any of the five years of the commitment period, this is very unlikely. In addition, under the scheme proposed in the next section, the Australian Government is likely to have a tranche of permits held in reserve as a result of falling emissions from land clearing. These could be auctioned if necessary.

5. Permit numbers, prices and revenue

5.1 The annual path of permits

It is proposed that the initial period for the operation of the trading scheme begin in 2001 and finish in 2012, the end of the first commitment period under the Kyoto Protocol. Setting a path over time for emissions depends most importantly on the actual emission levels at the start of the period and the desired emission levels at the end of the period.

In Section 3 it was shown that declining emissions from land clearing will permit emissions from energy consumption to be substantially higher than 108% of 1990 levels while still allowing Australia to meet its obligations under the Kyoto Protocol. It was indicated that a target of at least 120% in 2010 is realistic.[32]

However, there are good grounds for setting the desired emission levels from energy at 108%. Firstly, industry has accepted that the target is 108% and recognised on that basis that Australia received a 'good deal' at Kyoto. Secondly, there is some uncertainty about emissions from land clearing in the 1990 base year, so that the level permitted for energy emissions over and above 108% may change as the inventory data are refined. Thirdly, exclusion of emission reductions from land clearing would leave the government with a tranche of emission permits which in subsequent years it could use to stimulate new entrants into the energy industries or simply to cover contingencies as the end of the commitment period approaches. Finally, if the domestic trading system is made conformable with the emerging international system, and the government is left with surplus permits then it will be able to sell them, as a portion of Australia's 'assigned amount', to other Annex B parties to the Protocol thereby generating a windfall for the Australian taxpayer. However, their prices in an international system are likely to be lower than in the pre-2008 domestic system.

On this basis the proposed path of emissions and allocation of emission permits for each year in the period 2001-2012 are shown in Figure 5.1 with the annual number of emission permits for both 108% and 120% targets shown in Table 5.1. The allocation allows emissions to grow at their projected levels for a year or two after the initiation of the cap-and-trade system, but then begins to reduce allowable emissions until they reach an average of 108% of 1990 levels across the five-year period 2008-2012. Figure 5.1 also includes an emission reduction path based on a 120% target in order to illustrate the extent of the upward flexibility that the 'Australia clause' is expected to permit.

5.2 Timing of auctions and the costs of emission reductions

Over the period 2001-2012, permits accounting for roughly 4,000 Mt of CO_2 or 1,100 Mt C would be auctioned. There are a number of options for the timing of the issuing of the permits. The allocation for each year could be auctioned at the beginning of

[32] The inclusion of new sinks will add further to this total, although as argued in Section 4, the international system is likely to take a restrictive interpretation of allowable sinks, and the commercial attractiveness of sinks will diminish when rules emerge to translate carbon fixed into emission credits. Credits from CDM are not relevant to the domestic trading system described here except in the years of the commitment period.

Figure 5.1 Path of emissions for targets of 108% and 120%

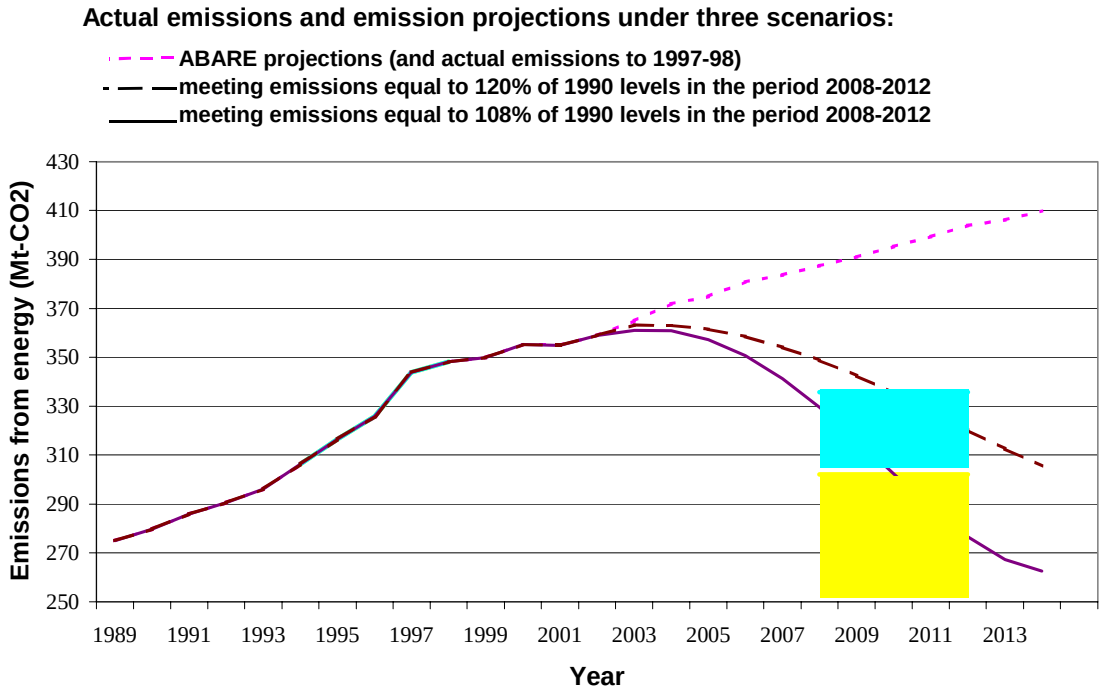


Table 5.1 Numbers of emission permits available under the projected path

Target	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	Mean 08-12	Target 08-12
108% Mt CO_2	354.9	358.9	361.1	360.8	357.2	350.6	341.2	329.5	316.3	302.3	288.7	276.6	302.7	302.1
Mt C	96.8	97.9	98.5	98.4	97.4	95.6	93.1	89.9	86.3	82.4	78.7	75.4	82.5	82.4
120% Mt CO_2	354.9	358.9	363.2	363.0	361.4	358.4	354.1	348.8	342.4	335.3	327.8	320.1	334.9	335.7
Mt C	96.8	97.9	99.0	99.0	98.6	97.7	96.6	95.1	93.4	91.5	89.4	87.3	91.3	91.5

each year, or the end of the preceding year. Alternatively, all permits covering the period 2001-2007 could be auctioned at once at the beginning of 2001. For the reasons explained in the previous section, permits for the commitment period could not be auctioned until the beginning of 2008 unless a mechanism to accommodate banked permits in the commitment period is incorporated at the outset. Another method would see permits auctioned every three years for the subsequent three years.

The timing issue requires further consideration beyond the scope of this paper, but a few points are worth noting here. If all permits were auctioned at once, entities required to hold permits in order to emit would need to anticipate their requirements over the whole period. This may encourage more careful planning. Third parties may buy permits with a view to making speculative profits. In order to avoid both a large drain on corporate resources at the beginning of the scheme, and an excessive one-off flow of revenue to the Commonwealth, successful bidders could be required to pay for their permits only in the year in which they are acquitted (except for a non-refundable deposit).

The fact that the emission caps do not 'bite' for the first year or two will not mean that prices of permits will initially be low, since banking allows excess permits to be carried over to subsequent periods. The opportunity to bank unused permits means

that the actual acquittal of emissions may vary from the path laid down in Table 5.1, although the total emissions over the period 2001-2012 will be fixed (after adjustment for emission credits due to allowable sinks). This is illustrated in Figure 5.2.

Figure 5.2 Flexibility provided by banking and borrowing

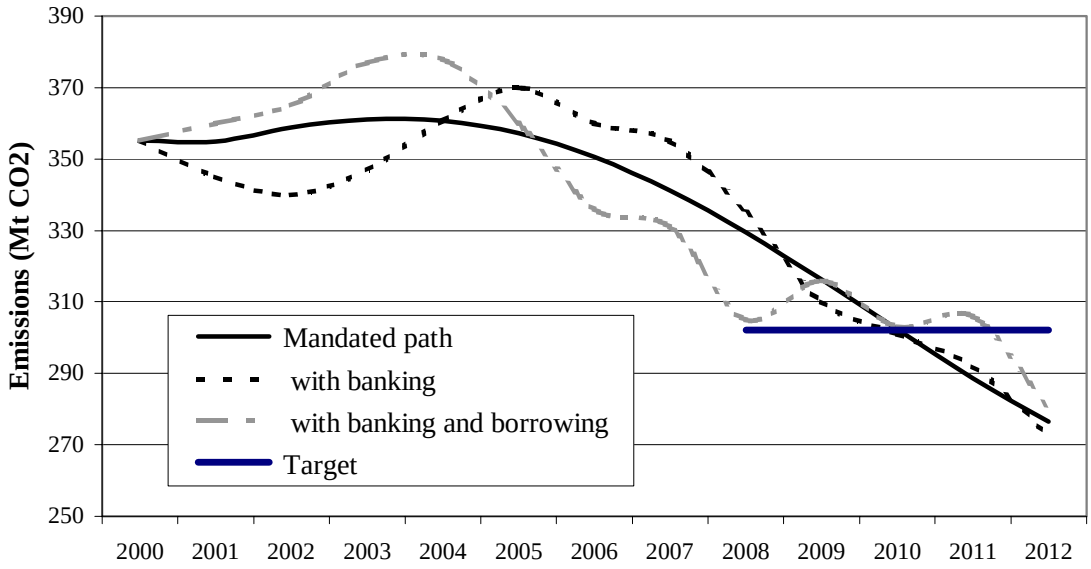


Figure 5.2 suggests an important point about the economic costs of reducing emissions. The principal purpose of introducing a domestic trading scheme in 2001 is to assist Australia to achieve its emission reduction obligations under the Kyoto Protocol. It could be argued that a domestic trading system prior to the commitment period in 2008-2012 is unnecessary because the market will determine the optimal path to reach the target. In this view, introducing emissions trading before the commitment period simply imposes a constraint on how the economy reaches the target and this limitation on the flexibility of business decision-making imposes a cost. This seems to lie behind the AGO position in effectively ruling out a mandatory trading system before the commitment period.

However, this argument reflects an unworldly appreciation of how business operates. It depends, in the first instance, on an assumed level of certainty about the emission targets that each firm believes it will face in 2008-2012. Many businesses, including large ones, will simply defer consideration of the emissions issue until the commitment period approaches, and may put more effort into lobbying for some way of avoiding the need to reduce emissions rather than reducing emissions. In other words, the certainty imposed by a prior domestic system will induce the action needed. In addition, as the AGO points out (1999b, p. 21-22), there may be significant advantages from learning-by-doing in participating in a domestic scheme. Thirdly, an earlier requirement to meet targets, including replacement of long-lasting equipment, is likely to give firms more choice in investment planning. In addition, more time will be available for the development of new abatement technologies.

Finally, the domestic scheme proposed here includes the opportunity for banking and limited borrowing and this introduces considerable flexibility into the emissions path. The opportunity for both banking and borrowing would introduce complete flexibility

but, as we have indicated, there are significant risks associated with unrestricted borrowing.

5.3 The price of permits

The prices of emission permits will be determined at the auctions. Prices will reflect the expected divergence between the number of permits available and the demand for them. The demand for permits will be influenced by the expected growth in demand for the products responsible for emissions (electricity, transportation etc.) and the cost of abatement opportunities including technological changes that result in lower emissions.

On the other hand, if an international emissions trading system is established and the Australian system dovetails with it, in the way proposed in Section 4.8 above, permit prices for emissions in the commitment period and beforehand may be set on world markets. If the cost of domestic emissions abatement in Australia is below that of other Annex B countries then the price of Australian permits (parts of our assigned amount) will be bid up to the world price. If abatement costs more in Australia than elsewhere then domestic polluters will buy permits from overseas in the commitment period. In general, there will be wider market for abatement opportunities in an international system and this will mean that the price of emission permits in an international system (covering Annex B countries and including CDM) will be lower than in a domestic Australian system.

While the expected permit prices cannot be known with any degree of certainty, there is information that provides a guide to the likely range. Information on the price of emission permits can be gained from both economic modelling studies and from the existing market for 'carbon offsets' generated from renewable energy sources and reforestation activities that has sprung up in anticipation of emergence of a legal market for permits under the Kyoto Protocol. Various estimates of the price of emission permits are reported in Table 5.2. It should be pointed out that permit prices estimated by the economic models are for trading among Annex B countries. A more restricted domestic market in Australia would see a higher permit price, possibly twice as high.

In its recent discussion paper, the AGO considers a number of estimates of permit prices based on economic models, and concludes that permits in an international trading system in the commitment period would be valued in the range $10 to $50 per tonne of CO_2 with a mid-range value of around $30 (AGO 1999b, p. 14). The figures reported by the AGO indicate that the price of permits in a domestic system would be higher.

While acknowledging that all analysts in this areas must rely on some guesswork, the reliance on modelling results may mean that the AGO has overestimated the likely permit price. Most economic models do not adequately capture the available emission reduction opportunities or the likely behavioural responses to rising energy prices. In particular:

- economic models usually assume that there is no scope for improving energy efficiency because markets are assumed to operate efficiently. Some studies

estimate that 'no-regrets' energy saving measures may be as high as 30% of energy used in Australia (Wilkenfeld 1996);

- economic models tend to underestimate the role of technological change in response to policies such as emissions trading and carbon taxes; and
- economic models tend to assume minimal substitutability between fuels and among products.[33]

Table 5.2 Estimates of the price of emission permits (A$/t CO_2)

Source	Basis for estimate	Scope of trading	Price in $A
Modelling estimates			
Hansen and Laitner (1998)	CGE model	Annex B	20
Austin *et al.* (1998)	Four models	Annex B	5-11
IAT (1997)	CGE (SGM model)	Annex 1	10
CEA (1998)	CGE model	Annex B + CDM	10-17
Kypreos (1998)	Global MARKAL-MACRO Trade Model	Annex B	16
AGO (1999b)	Several models	Annex B	10-50
Market prices			
Trexler (1999)	1999 market price for carbon offsets		7.50-15.00
Canadian wind power firm: carbon offset	1998 market price for carbon offsets		34
Reforestation in Australia (private estimates)	1999 cost of production		25
Alise Energy[a]	Value of emission cut from new gas power plant		6.80

Notes: The modelling results are based on the need to meet the Kyoto target, except for the IAT results which are based on stabilisation (including Russian hot air).
The price of a permit for a tonne of CO_2 can be converted to the price for a tonne of C by multiplying by 44/12 (MW CO_2 = 44 g/mol, MW C = 12 g/mol, 1 molecule of C in every molecule of CO_2).
a. Assumes an exchange rate of A$1 = US$0.67.
b. Alise Energy from report in the *Australian Financial Review* 19 January 1999.

[33] For a detailed analysis of the effect of modelling assumptions on estimates of the costs of abatement see Repetto and Austin (1997). For a detailed discussion of the assumptions of the MEGABARE model see Hamilton and Quiggin (1997). Curiously, the AGO makes very similar criticisms of ABARE's over-estimates of abatement costs. In a paper that argues that large emission reductions can be had from the $400 million dollars for greenhouse programs agreed by the Government with the Australian Democrats during the GST negotiations, the AGO suggests that ABARE's estimate of a domestic permit price of $87 per tonne of CO_2 is more than double the true value. (Document tabled in the Senate on 28 June 1998).

In other words, the real costs of abatement in the years following introduction of emissions trading are likely to be lower, and possibly much lower, than the models indicate. This was certainly the case with the introduction of sulfur dioxide trading in the USA.

With these considerations in mind, on balance the price of emission permits in a domestic trading system may be around $20 per tonne of CO_2, and quite possibly lower. We have used $20 as a benchmark, along with a lower estimate of $15, in calculating the expected revenue from auctioning permits.

The actual price will depend on the total number of emission permits issued by the government over the specified period. The total volume of permits over the period is given by the area under the path shown in Figure 5.2. A path that rises more steeply early and falls more sharply later will be associated with a lower permit price. The opportunity for banking means that the price of permits will be smoothed over the whole period, although other factors (such as economic cycles and developments in abatement technology) will cause fluctuations.

Trexler argues with respect to offsets (which will be close substitutes for allocated permits and therefore will be priced the same) that 'Notwithstanding today's low offset prices, as the definition of what projects will be creditable is clarified, the price of offsets will rise' (Trexler 1999, p. 10). On the other hand, technological progress and unexploited energy efficiency opportunities are likely to drive the price down.

5.4 Revenue from emissions trading

Combining the number of permits available in each year in Table 5.1 with the price of $20/t CO_2 provides an estimate of the revenue that the Commonwealth would gain from auctioning permits. These revenue estimates are shown in Table 5.3. At this price, on average the Commonwealth would derive around $7 billion per annum from the emissions trading system. The revenue estimates for a price of $15/t CO_2 are also shown along with the revenue stream which would average around $5 billion per annum. In the next section we consider how this revenue could be used in the reform of business taxation.

If the target is set at 120% instead of 108% then the number of emission permits to be auctioned are as shown in Table 5.1. The revenue stream depends on the price set at auction. We would expect the price to be lower if more permits are issued, so that the lower price will, to some extent, offset the increased number of permits. Whether revenue is higher or lower depends on the slope of the demand curve for emission permits which in turn depends on the marginal cost of abatement. If the marginal cost of abatement at the target of 108% is rising steeply then the revenue produced at a more lenient target (of 120%) will be lower because it will be much cheaper to invest in abatement measures.

5.5 Other policies

The domestic emissions trading scheme described here would be the major policy instrument required to meet Australia's Kyoto commitments and would substitute for many of the greenhouse policies currently in place. Among others, the Greenhouse Challenge Program could be abolished.

Table 5.3 Revenue from sale of emission permits, 108% target, 2001-2012

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
$20/t CO_2												
Rev. ($m)	7,097	7,178	7,221	7,216	7,145	7,012	6,824	6,591	6,326	6,046	5,773	5,531
$15/t CO_2												
Rev. ($m)	5,323	5,383	5,416	5,412	5,359	5,259	5,118	4,943	4,744	4,535	4,330	4,148

However, three types of greenhouse programs should be retained. Firstly, programs that stimulate the development of the renewable energy and energy efficiency industries will reduce the cost of meeting emission targets, especially in the longer term, and should be encouraged. This would provide a rationale for retention of the 2% renewables policy. Secondly, since even the upstream approach to capping emissions does not cover non-fossil emission sources, programs to limit emissions in areas not covered and to protect sinks will be required, notably in agriculture, waste management, land use and forestry. Finally, some programs aimed at reducing emissions in sectors that would be covered by the cap-and-trade system have other environmental and social benefits which may be lost if they are abolished. Examples include transport planning and traffic management.

6. Options for business tax reform

6.1 Tax reform options

This section considers a number of options for the reform of business taxation in Australia which incorporate the revenue stream that auctioned emission permits would generate. The business tax changes considered here include one of the main reforms canvassed in the Ralph review 'Platform for Discussion', notably a reduction in the rate of company tax paid for with the abolition of accelerated depreciation, but goes beyond them. The policy variables considered are:

- reduction in the rate of company tax from 36%;
- abolition or revision of accelerated depreciation;
- reduction or abolition of payroll taxes; and
- introduction of a system of auctioned emission permits.

The option in the Ralph report that has attracted most attention is the proposal to reduce the rate of company tax from 36% to 30% and to offset the revenue loss by abolishing accelerated depreciation. According to the Ralph report, reduction of the company tax rate would result in a revenue loss of $3,100 million in 2003-04 while abolition of accelerated depreciation is expected to result in a revenue gain of $2,400 million, although there is considerable uncertainty about this number. The year 2003-04 is chosen by the Ralph report to allow the changes to have their full revenue impacts. The shortfall of $700 million would in part be made up by other changes to tax laws governing investments, but this would still leave a deficit of $200 million.[34]

The revenue implications of the various tax change measures in the year 2003-04 are shown in Table 6.1. It should be noted that company tax and accelerated depreciation are tax instruments applied to company profits while payroll tax and emissions permits are taxes applied to business inputs. Changes in these taxes may affect business behaviour differently. In some circumstances, input taxes may be fully passed on to consumers. The revenue effects estimated in Table 6.1 are first round or simple effects only. In other words, they do not take into account changes in business behaviour induced by the tax changes.

Other options for treatment of accelerated depreciation have been investigated by the Ralph review. These include retention of the existing system, changing to effective life treatment and changing to effective life with a 50% loading to remove distortions in the current system. The latter would result in an estimated additional revenue of $900 million at a 33% company tax rate or $820 million at a 30% company tax rate (compared to $2,400 million from the abolition of accelerated depreciation with a 30% rate and $2,900 million at a 36% rate) (Treasury 1999, p. 122-3).

[34] Information from the Ralph Secretariat suggests that this deficit may increase in subsequent years (*Australian Financial Review* 28 April 1999).

Table 6.1 Business tax reform measures and revenue effects in 2003-04

Measure	Revenue impact ($m)
Reduce company tax rate	
– from 36% to 30%	–3,100
– from 36% to 33%	–1,550
Abolish accelerated depreciation	
– replace with effective life	+2,400
– replace with effective life plus 50% loading	+820
Reduce payroll tax	
– reduce by 60%	–5,700
– abolish	–9,500
Introduce emissions trading	
– permit price $20/t	+7,200
– permit price $15/t	+5,400

Sources: The figures on company tax and accelerated depreciation are from Treasury (1999) Tables 39.1, A.1, with the figure for the reduction to 33% in company taxes a simple proportion. (Note that the revenue impact of abolishing accelerated depreciation is presented for a company tax rate of 30%.) The figure for payroll tax payments is an extrapolation (assuming 2.5% annual growth) from payroll tax collections in 1997-98 derived from budget information published by all Offices of State Revenue. The figures for emissions trading were derived in Section 5 of this report.

Combining the tax changes in Table 6.1 in different ways provides a number of options for business tax reform building on the introduction of an emissions trading scheme. These options are summarised in Table 6.2. Revenue from emissions trading is estimated assuming permit prices of $20/t and $15/t CO_2.

Option 1 in Table 6.2 illustrates how the proposed reduction in the company tax rate could be financed by introducing emissions trading. Accelerated depreciation could be retained under this option and, even with a permit price closer to $15 per tonne, excess revenue would be available to provide subsidies to energy-intensive exporting or import-competing industries or to reduce other taxes. This presents a way in which companies can benefit from lower taxes while Australia meets its obligations under the Kyoto Protocol. Such a measure is not only consistent with the Government's aim of promoting Australia as a centre for financial service industries, but also protects capital investment by maintaining accelerated depreciation.

Building on the additional revenue from emission permit auctions, there are other ways in which business taxation could be reformed. Option 2 combines the accelerated depreciation-company tax swap proposed in the Ralph review with emissions trading and a 60% reduction in payroll tax. This option illustrates the potential to reduce one of the most significant burdens on business and employment. Option 3 illustrates how, by forgoing a reduction in company tax and abolishing accelerated depreciation, payroll tax could be eliminated entirely.

Table 6.2 Options for business tax reform including introduction of emissions trading

Tax changes	Revenue implications ($m in 2003/4) Permit price $20/t	Permit price $15/t
Option 1		
Emissions trading scheme	+7,200	+5,400
Reduce company tax rate to 30%	–3,100	
Retain accelerated depreciation	0	
No change in payroll tax	0	
Net revenue effect	**+4,100**	**+2,300**
Option 2		
Emissions trading scheme	+7,200	+5,400
Reduce company tax rate to 30%	–3,100	
Abolish accelerated depreciation	+2,400	
Reduce payroll tax by 60%	–5,700	
Net revenue effect	**+800**	**–1,000**
Option 3		
Emissions trading scheme	+7,200	+5,400
No change to company tax rate	0	
Abolish accelerated depreciation	+2,900	
Abolish payroll tax	–9,500	
Net revenue effect	**+600**	**–1,200**
Option 4		
Emissions trading scheme	+7,200	+5,400
Reduce company tax rate to 33%	–1,550	
Replace accelerated depreciation with effective life +50% loading	+900	
Reduce payroll tax by 60%	–5,700	
Net revenue effect	**+850**	**-950**

However, there may be grounds for retaining some form of accelerated depreciation allowance to promote capital investment. There is also scope to reduce the company tax rate, but in stages. Option 4 shows the impact of reducing the company tax rate from 36% to 33% and replacing accelerated depreciation with an effective life treatment with a 50% loading (one of the options considered by the Ralph review). These two measures still provide for a large reduction in payroll tax.

Other permutations could be considered. Given the uncertainty associated with the revenue that would flow from emissions trading, it may be desirable to decide to reduce payroll tax by the amount of revenue generated through auctioning emission permits, perhaps as some variation on Option 4. The next section provides an initial assessment of the effect of various options on industry sectors.

6.2 Economic impact of options

In this section we provide some analysis of the effects of these options on broad sectors of the economy. While company tax applies to all sectors equally, accelerated depreciation favours industries that are capital intensive, payroll tax disadvantages industries that are labour intensive and emissions trading will favour industries that have low energy intensities.

Table 6.3 illustrates the source of emissions and allocates emissions from electricity, gas, coal and transport fuels according to the sector consuming these forms energy. The numbers in Columns 2, 3 and 5 of the table correspond to the charts in Figure 3.1. Column 2 presents emissions at source but uses a broad definition of the transport sector beyond that used by ANZSIC.[35] Column 4 overcomes this inconsistent treatment of transport, allocating emissions from private and own-business transport consistent with ANZSIC industry definitions of the transport sector. The last column in Table 6.3 allocates electricity use as well as transport (this removes any distinction between burning fossil fuels on site as opposed to burning them off-site and consuming electricity).

Columns 3 and 5 of Table 6.3 show how emissions from the electricity sector, and the cost of emissions from this sector, will be passed on to consumers of electricity. The structure of each industry sector will determine the extent to which the costs of emission permits can be passed on further, or are absorbed. For each of the Options discussed above, the incidence of emission permit costs is presented according to transport-corrected sectoral source of emissions (Column 4 in Table 6.3) and

Table 6.3 Sources of CO_2 emissions allocated according to industry sector energy consumption (Mt)

	CO_2 emissions			
	Column 2:	Column 3:	Column 4:	Column 5:
	At source of emissions[a]	Allocating electricity use only	Allocating private and own-business transport only	Allocating both electricity and transport
Primary Production	4.0	6.6	6.3	9.0
Mining	12.5	25.2	12.9	25.6
Manufacturing	49.2	124.7	51.0	126.5
Utilities	183.9	0.0	184.3	0.4
Construction	3.2	3.2	5.4	5.4
Transport	81.8	84.0	29.5	31.7
Other	1.3	9.9	1.3	9.9
Commercial	3.7	41.2	15.2	52.7
Residential	7.0	51.7	40.7	85.4
Total	**346.6**	**346.6**	**346.6**	**346.6**

a. These emissions calculations have been generated from Bush *et al.* 1999. Transport emissions include all transport not just emissions from those enterprises operating in the ANZSIC-defined transport sector. Column 4 allocates own-business and private transport thereby ensuring the transport sector is treated consistently.

Source: Bush *et al.* 1999; AUSTROADS 1999; NGGIC 1997

[35] Energy-use statistics provided by ABARE (Bush *et al.* 1999) assign all transport emissions to the transport and storage sector. This is inappropriate because most of these emissions are created by private transport or by industries outside the transport and storage sector.

Table 6.4 Incidence of emission permit costs and tax changes under Option 3 ($m)

Sector	Emission permit costs: at source[a]	Emission permit costs: allocating electricity[b]	Payroll tax reduction	Increased tax from loss of AD[c]
Primary production	127	180	-[d]	-
Mining	258	512	(301)	-
Manufacturing	1,020	2,530	(1,708)	-
Utilities	3,685	8	(176)	-
Construction	108	108	(274)	-
Transport and storage	590	634	(579)	-
Industry not stated[e]	27	198	-	-
Commercial	304	1,054	(5,035)	-
Residential	814	1,708	-	-
Total revenue	**6,932**	**6,932**	**(8,074)**	**2,880**

a. Assuming \$20/tonne-CO_2. Emissions at source (see Column 4 in Table 6.3).
b. As in a, except emission costs from electricity generation are passed on to consumers of electricity.
c. The extent to which different industries will be affected by abolition of accelerated depreciation is impossible to determine without knowing the types, ages and rates of economic depreciation of assets used in these industries. See Section 2 for a discussion of the impact of this measure.
d. Not known.
e. Industry not stated category is not consistently classified across emissions and payroll liability. Accordingly, estimates of revenue and cost impacts on this sector may be unreliable.

assuming electricity sector emissions are fully allocated (Column 5). The impact of Option 1 is presented in Appendix 3.

Table 6.4 shows the impact of business tax reform Option 3. Using the most recent payroll and emissions information, the impact of abolishing payroll tax and introducing a system of emissions trading where the permits are auctioned would have a net cost to government revenue of about \$1.1 billion (eliminating accelerated depreciation would more than cover this shortfall). Again, the actual sectoral impact of such a measure will depend on the ability of companies to pass on costs, or appropriate any reductions in payroll tax as higher profits. However, industries that are more labour-intensive and less energy-intensive will benefit by more under this option.

As can be seen from Table 6.4, the actual effect on industry costs and revenue will depend on the extent to which the cost of emission permits can be passed on to consumers, both private and business. The extent to which the costs of electricity emissions can be passed from the utilities sector to other sectors, and the extent to which higher energy costs lead to higher prices for other goods and services. The distribution of costs is complicated further in Options 1, 2 and 4 by a reduction in company tax rates. Companies will be able to absorb some of the additional costs, and still be in a better profit position because they will pay lower company tax.

Payroll tax revenue is expected to grow faster than greenhouse gas emissions[36] and, as a result, emissions revenue in 2003-2004 will be insufficient to cover the cost of abolishing payroll tax. Importantly, the divergence will grow as the number of emission permits falls as the commitment period approaches.[37] To bring this measure towards revenue-neutrality, Option 3 proposes the removal of accelerated depreciation. Any remaining short-fall could be covered by implementing the changes to leasing and rights, mining losses, buildings and structures and mining and quarrying as proposed by Ralph (Treasury, 1999, Table 39.1).

There are other options for restructuring payroll tax that have a smaller revenue impact. For example, Options 2 and 4 include a 60% reduction in payroll tax but maintain overall government revenue. These two options differ in their treatment of company tax and accelerated depreciation, although there is little difference in net revenue terms. The impact of Option 4 is illustrated below in Table 6.5.

The commercial sector (which includes wholesale and retail trade, communication, financial and business services, health and community services, government services and cultural and recreation services) appears to benefit the most from Option 4,

Table 6.5 Incidence of emission permit costs and tax changes under Option 4 ($m)

	Emission permit costs: at source[a]	Emission permit costs: allocating electricity[b]	Payroll tax reduction[c]	Reduction in company tax payable	Increased tax from AD changes[d]
Primary production	127	180	not known	(18)	-
Mining	258	512	(181)	(145)	-
Manufacturing	1,020	2,530	(1,025)	(255)	-
Utilities	3,685	8	(106)	(4)	-
Construction	108	108	(165)	(38)	-
Transport and storage	590	634	(348)	(40)	-
Industry not stated	27	198	-	(34)	-
Commercial	304	1,054	(3,021)	(979)	-
Residential	814	1,708	-	-	-
Total revenue impact	**6,932**	**6,932**	**(4,845)**	**(1,513)**	**900**

a. At $20 per tonne CO_2 and 1997-98 emissions data (derived from Bush *et al.* 1999, Table B1).
b. Assigning emissions from electricity to the sectors that consume the electricity.
c. Emissions are not projected to grow as fast as payroll tax revenue. As a consequence, using revenue and emissions data from 1996-98 produces a revenue positive outcome for Option 4 when payroll taxes are reduced by 60%.
d. From change to accelerated depreciation ($900 million at 33%). The extent to which different industries will be affected by a change to effective-life plus 50% loading is impossible to determine without knowing the types, ages and rates of economic depreciation of assets used in these industries.

[36] Based on Bush *et al.* 1999, Table B1.
[37] This is illustrated in Table 5.3. However, even though revenue from emission permit auctions is predicted to fall eventually, a reduction in company tax or payroll tax for 10+ years can be expected to have a significant impact on employment and growth. In addition, other sources of revenue may have been created over this period, it may be necessary to begin raising some business taxes again.

whereas the impacts on the resource-intensive mining, manufacturing and transport sectors are unclear. The ability of the electricity utilities to pass on additional costs will, again, be an important determinant of the overall impact of Option 4. Within sectors, different subsectors will face different impacts depending on their use of labour, energy and capital.

The broader economic impact of some of the major components of Options 2, 3 and 4 have been modelled by others. The overall economic impact of replacing payroll taxes with a carbon tax of $23 per tonne CO_2 has been modelled using the ORANI-E model by Common and Hamilton (1996). That rate would have generated enough revenue to abolish payroll tax in 1992-93. However, the measure proposed here is not a tax, but a system of auctioned emission permits. Under a carbon tax, polluters will reduce emissions when the marginal cost of abatement is below $23 per tonne CO_2. With emission permit auctioning, emission levels are fixed and the price of a permit is determined by the economy-wide marginal cost of abatement. The impacts of the payroll tax-carbon tax swap estimated by ORANI-E are shown in Table 6.6.

Not surprisingly, replacing a tax on labour with a tax on energy tends to increase employment and reduce CO_2 emissions. Inflation is also reduced while the overall economy receives a small stimulus. Similar affects should occur with emissions trading, although trading introduces added flexibility.

The work of Common and Hamilton (1996) and others suggests that measures to increase the cost of energy while reducing the costs to labour are effective in reducing CO_2 emissions and may stimulate employment. Moreover, these measures do not have a depressive effect on the economy and are not particularly regressive (Gee 1996c, p. 38; see also Appendix 4 in this report). Accordingly, replacing payroll tax with emission permit auctioning and trading is a viable option for business tax reform. Because of uncertainty regarding the revenue generated from auctioning permits, it may not be possible to abolish payroll taxation, only to reduce it significantly.

Table 6.6 Economic impact of payroll-carbon tax swap (% change)

	Carbon tax rate	
	$7.40/t CO_2	$23/t CO_2
GDP	+0.07	+0.20
CPI	–0.18	–0.57
Budget balance	–0.02	–0.14
Employment	+0.21	+0.69
CO_2 emissions	–3.9	–11.7

Source: Common and Hamilton (1996)

6.3 Final comments

It makes little sense to tax either labour or capital. Taxes on labour discourage employment and may introduce inefficiencies into production decisions. Accordingly, there may be strong grounds for the abolition of payroll tax. Taxes on capital discourage the replacement of older equipment and may slow down the application of new technologies. From an environmental perspective, some forms of renewable energy and pollution prevention equipment rely on capital intensive investment and technologies. As such, there may be grounds for the retention of some form of accelerated depreciation. On the other hand, the current system favours mining and forestry activities, which may have a large impact on the environment, compared to some service sectors. An appropriate compromise may be to replace the existing depreciation scheme with effective life treatment with a loading, thereby treating all investments equally.

There are concerns that higher energy prices due to the cost of emission permits would disadvantage poorer households. Modelling studies suggest that it would be slightly regressive, but not as much as is commonly thought. The effect of emissions trading at different permit prices on the prices of electricity, gas and petrol is shown in table A4.1 of Appendix 4. At a price of $20 per tonne of CO_2, it is expected that electricity prices will rise by 1.9 c/kWh (around 15-20% for domestic customers), gas by $1.03/GJ (around 9-13% for domestic customers) and petrol by 4.5 c/l (around 6%). Against this, tax reform that results in net employment creation will promote equity as unemployment is one of the principal causes of inequality. In addition, some of the revenue from auctioning emission permits could be ear-marked to provide compensation, such as through pension increases and reduced income taxes for low-income earners. Alternatively, supplementary policies could promote the spread of highly fuel-efficient vehicles and energy-saving household equipment, so that over time, while each litre or kilowatt of fossil-fuel based energy might rise in price, overall fuel bills will decline.

References

ACIL 1998. Mandatory target for renewable energy in power supplies, Report to Victoria Department of Treasury and Finance Energy Projects Division, June

AGO 1999a. National emissions trading: establishing the boundaries, Discussion Paper 1, Australian Greenhouse Office

AGO 1999b. National emissions trading: issuing the permits, Discussion Paper 2, Australian Greenhouse Office

ANTS 1998. A new tax system, Commonwealth of Australia, August 1998

ATO 1999. Taxation statistics 1996-97, Commonwealth of Australia, March 1999

Austin, D. *et al.* 1998. Opportunities for financing sustainable development via the CDM: a discussion draft (7 November). Reported in *Global Greenhouse Emissions Trader* (February 1999)

Austroads 1999. Implications for the road transport sector of potential tax reform, Report No. AP-135/99

Bureau of Rural Sciences 1999. Remote sensing of agricultural land cover change: 1990-1995, Results, www.brs.gov.au

Bush, S., Dickson, A., Harman, J. and Anderson, J. 1999. Australian energy: market developments and projections to 2014-15, ABARE Research Report 99.4, Canberra.

CEA (Council of Economic Advisers), 1998. The Kyoto Protocol and the President's policies to address climate change: Administration Economic Analysis', Washington D.C., July

Center for Clean Air Policy 1998. US carbon emissions trading: description of an upstream approach, CCAP, Washington, March, www.ccap.org

DEWRSB 1999. Small Business Roundtable submission to Ralph Review Platform for Discussion

Dobes, L. 1998. The transport sector: is a carbon tax better? *in* Bureau of Transport Economics, Trading greenhouse emissions: some Australian perspectives, BTE, Canberra

Gee, D. 1996a. Eco-nomic tax reform in Europe, Environmental Taxation and Accounting 1(1)

Gee, D. 1996b. The growing interest in eco-nomic tax reform, Environmental Taxation and Accounting 1(2)

Gee, D. 1996c. Obstacles to eco-nomic tax reform in Europe, Environmental Taxation and Accounting 1(3)

Hagan, J. 1998. Emissions trading – making it work? *in* Bureau of Transport Economics, Trading greenhouse emissions: some Australian perspectives, BTE, Canberra

Hamilton, C. 1998. The evolution of the global market for greenhouse gas emission allowances, Background Paper No. 16, The Australia Institute, Canberra

Hamilton, C. and Quiggin, J. 1997. Economic analysis of greenhouse policy: a layperson's guide to the perils of economic modelling, Discussion Paper No. 15, The Australia Institute, Canberra

Hamilton, C. and Vellen, L. 1999. Land-use change in Australia and the Kyoto Protocol, Environmental Science and Policy 2, 145-152

Hansen, D. and Laitner, J.A. 1998. The economic effects of policies that increase investments in cost effective energy-efficient technologies, Symposium on Energy Policy after the Kyoto Climate Protocol, Illinois Economic Association, October

IAT (Interagency Analytical Team) 1997. Economic effects of global climate change policies.

Kypreos, S. (1998). The Global MARKAL-MACRO Trade Model. Reported in *ETSAP News* October 1998 (International Energy Agency, OECD)

Laitner, J. 1999. The economic effects of climate policies that increase investments in cost-effective, energy-efficient technologies: further insights, Paper presented at the Eastern Economic Association Annual Meeting, Boston, March 12 1999

NGGIC 1996. Workbook for transport (mobile sources), National Greenhouse Gas Inventory Committee, Environment Australia

NGGIC 1997. National greenhouse gas inventory 1995, National Greenhouse Gas Inventory Committee, Environment Australia

NGGIC 1998. National greenhouse gas inventory 1996, National Greenhouse Gas Inventory Committee, Environment Australia

Pender, H. and Ross, S. (EPAC) 1995. Business taxation in Australia and Asia, EPAC Paper no. 4, AGPS Canberra, February

Repetto, R. and Austin, D. 1997. The costs of climate protection, World Resources Institute: Washington

Ryan, C.J. 1990. Inflation and corporate taxation in Australia, Research Discussion Paper 9011, Reserve Bank of Australia

Treasury 1998a. A strong foundation: establishing objectives, principles and processes, RBT Discussion Paper, November 1998

Treasury 1998b. An international perspective: examining how other countries approach business taxation, RBT Discussion Paper, December 1998

Treasury 1999. A platform for consultation: building on a strong foundation, RBT Discussion Paper 2, February 1999

Trexler and Associates 1999. Assessing the state of the GHG market: using the Greenhouse Gas Offset Cost Assessment Decisionmaking (GGOCAD) Model, Research Report, January

Tulloch, G. 1999. Capital gains tax reform – an opportunity for the sustainable energy industry in Australia, Forum – Tax Reform and the Sustainable Energy Industry, Parliament House Canberra 25 May

Walters, R. and Dippelsman, R. 1985. Estimates of depreciation and capital stock, Australia, ABS Occasional Paper 1985/3

Wilkenfeld, G. 1996. Energy efficiency programs in the residential sector *in* Greenhouse: Coping With Climate Change, edited by W. J. Bouma, G. I. Pearman and M. Manning (CSIRO Publishing: Melbourne)

Appendices

Appendix 1 Current statutory depreciation timeframes for various capital assets

Equipment and Machinery accelerated write-off quicker than life of equipment	**Cars and Motorcycles** accelerated write-off quicker than life of equipment but less accelerated than machinery and equipment	**Hotels and Motels** 25 years	**Industrial Buildings** 25 years	**Rental Buildings** 40 years
Timber Mill Buildings shorter of life of building and 25 years	**Mining Buildings** shorter of 10 years and life	**Quarry Buildings** shorter of 20 years and life	**Office Buildings** 40 years	**Lease Document Expenses** immediate deduction
Establishing Longer-Term Loan shorter of life of loan and 5 years	**Creating Intellectual Property** effective life of asset	**Registering Intellectual Property** immediate deduction	**Australian Films** immediate deduction	**Prepaid Contracts** shorter of life of contract and 10 years
Horticultural Plants Establishment accelerated write-off quicker than life of plant	**Grapevines** 4 years	**Electricity Connection** 10 years	**Telephone Connections** 10 years	**Mining Exploration** immediate deduction
Quarry Exploration immediate deduction	**Mining Operations** shorter of 10 years and life	**Quarry Operations** shorter of 20 years and life	**Mining Transport** shorter of 10 years and life	**Petroleum Pipelines** 10 years
Quarry Transport 20 years	**Forestry Roads** shorter of life and 25 years	**Research and Development** immediate deduction	**R&D Pilot Equipment** accelerated write-off quicker than life	**Election Expenses** immediate deduction
Environmental Impact Statements shorter of 10 years and life of project	**Pollution Control and Waste Mgmt** immediate deduction	**Farm Water Conservation & Conveyance** 3 years	**Landcare (Fences, Levees)** immediate deduction	**Computer Software** 2 ½ years (proposed)
Spectrum Licences effective life (proposed)	**Wasting Assets Not in Other Boxes** capital loss on expiry of the asset			

Source: Treasury 1998a, Fig. 3.3

Appendix 2 Comparison of company tax rates and depreciation rates

Country	Company tax rate	Depreciation rates	
		Equipment (~ 8 year life)	**Buildings**
Australia	36%	20%	2.5% or 4% of original cost of building
Canada	29% (+15% provincial)	20%	4% of purchase price
Chile	15% (+withholding taxes)	17%	7.7% of purchase price
France	40%	10%-20%	2%-5% of purchase price
Germany	47.475/31.65 %	10%-30%	2%-4% of purchase price
Ireland	25% — first IR£50,000, 32% — on balance, 10% for manufacturing	15% from years 1 to 6 10% for year 7	4% of original cost
Japan	48%	12% straight line 25% declining balance	2% of purchase price
New Zealand	33%	18.6%	4% of purchase price
Netherlands	35%	10%	2.5%-4%
Singapore	26%	20% initial allowance, balance over useful life	25% initial allowance, 3% for subsequent years Depreciation related to original cost with adjustment for initial year allowance
Sweden	28%	20%	4%-5%of purchase price
Taiwan	0% — below NT$50,000, 15% — NT$50,000 - 100,000, 25% — over NT$100,000	11.11% (based on useful life plus one year)	1.96% 6.25%=1/(15+1) based on purchase price. Rates based on expected life plus one year
United Kingdom	31%	17% (6% for useful life over 25 years)	4% based on original cost (industrial buildings and hotels only)
United States	35% (maximum)	1-27% (derived from double declining balance rate)	2.56% of purchase price

Source: Treasury 1998b, Table 3.1, Table 4.1

Appendix 3 Incidence of emission permit costs and company tax under Option 1 ($m)

	Emission permit costs: at source[a]	Emission permit costs: allocating electricity[b]	Decrease in company tax[c]
Primary production	127	180	(36)
Mining	258	512	(290)
Manufacturing	1,020	2,530	(509)
Utilities[d]	3,685	8	(9)
Construction	108	108	(76)
Transport	590	634	(80)
Other	27	198	(68)
Commercial	304	1,054	(1,958)
Residential	814	1,708	-
Total	**6,932**	**6,932**	**(3,026)**

* For 1996-97 company tax data and 1997-98 emissions data.

a. Assuming a permit cost of A$20/tonne CO_2. These costs are first-round only and do not incorporate, for example, the impact of electricity utilities passing on permit costs in the form of higher electricity prices.

b. Incorporates the impact of electricity utilities passing on permit costs in the form of higher electricity prices. This ignores options for electricity distributors to source electricity from lower emission sources.

c. Notional only, assumes taxable income and tax base does not change. That is, the impact of additional emission permit costs has not been included.

d. Does not account for income-tax equivalent distributions paid by utilities. However, the impact on this sector is apparently minimal since most of its emissions are attributable to other sectors. Subsequent changes in energy consumption resulting from higher energy costs will have an impact on electricity utilities.

The reduction in company tax payable by each sector is presented for comparison with the additional cost of emission permits. As discussed in Section 6, these figures are only approximations, since changes in the tax structure will induce a number of changes in the economy over time, changes that are not reflected in these figures. It is also assumed that the costs of emissions are borne by the emitting activity.

Appendix 4 Equity considerations

To the extent that auctioned emission permits act like a carbon tax in pushing up prices of energy-intensive commodities, there is a concern that emissions trading will be inequitable. The effect of emissions trading at different permit prices on the prices of electricity, gas and petrol is shown in table A4.1. At a price of $20 per tonne of CO_2, it is expected that electricity prices will rise by 1.9 c/kWh (around 15-20% for domestic customers), gas by $1.03/GJ (around 9-13% for domestic customers) and petrol by 4.5 c/l (around 6%).

Table A4.1 Changes to prices of electricity, gas and petrol due to different emission permit prices

	Electricity c/kWh	Gas $/GJ	Petrol c/l
$0 per tonne CO_2	0	0	0
$5 per tonne CO_2	0.48	0.26	1.2
$10 per tonne CO_2	0.96	0.51	2.3
$15 per tonne CO_2	1.4	0.77	3.4
$20 per tonne CO_2	1.9	1.03	4.5
$25 per tonne CO_2	2.4	1.28	5.6
$30 per tonne CO_2	2.9	1.54	6.8

Source: NGGIC 1998, p. 54; NGGIC 1996, p. 43; Bush *et al.* 1999, Table A10

Are the projected price rises regressive? It is often argued that poorer households spend a larger proportion of their income on fuels and energy than rich households. On the other hand, a poorer household may own fewer vehicles and appliances. However, poorer households are also less likely to be able to invest in energy-efficiency measures. Examining the impact of carbon taxes and auctioned emission permits on consumer prices for each income decile (Table A4.2) it becomes apparent that such measures are regressive, but not excessively so. Importantly, the figures in Table A4.2 do not account for changes to payroll tax that may promote increased employment, wage-growth and equity. Replacing payroll tax with a charge on greenhouse emissions has also been shown (in Table 6.6) to promote general economic growth. The long-term CPI effect in Table A4.2 is likely to be lower as energy-efficiency measures are introduced.

Table A4.2 CPI increase by income decile resulting from a permit price of $20 per tonne of CO_2

Decile	Petroleum, gas and electricity CPI
First	1.534
Second	1.657 (highest)
Third	1.604
Fourth	1.444
Fifth	1.452
Sixth	1.353
Seventh	1.313
Eighth	1.278
Ninth	1.164
Tenth	1.097 (lowest)

Source: Common and Salma (1992)

Appendix 5 Notes on capital gains tax

The Ralph review advocates three possible approaches to reforming the taxation of capital gains. These are briefly examined below. These proposals are then examined in terms of their impact on innovative high-technology industries, of which the sustainable energy industry is one. The treatment of investment in such industries has important implications for long-term economic and environmental outcomes.

One of the options proposed by the Ralph review is to introduce a 30% flat rate of capital gains tax. This is similar to the current CGT tax treatment, except that the current rate is determined by the taxpayer's marginal income tax rate. For companies this rate is 36%, and for private individuals anywhere from 0% to 48.5%. However, the current system taxes real capital gains only. The Ralph reforms propose capping the CGT rate at 30%, and "consideration would probably need to be given at the same time to the elimination of indexing and averaging" (Treasury 1999, p. 289). This suggests that under this proposal Australia would move from a CGT levied at a fixed rate on real capital gains to a CGT levied at a fixed rate on nominal gains (in periods of inflation the result would be a real rate greater than 30%). The real rates experienced by companies under this proposed scheme are compared to existing rates in Table A5.1.

Table A5.1 Real tax rates under a 30% capped CGT rate for companies

Years asset held	Real rate at a 30% fixed rate w/out indexation – assuming an asset that grows at 10% in real value per year	Current real rate	Inflation[a]
	%	%	%
1	39.0	36.0	3
2	38.5	36.0	3
3	37.9	36.0	3
4	37.5	36.0	3
5	37.0	36.0	3
6	36.6	36.0	3
7	36.1	36.0	3
8	35.8	36.0	3
9	35.4	36.0	3
10	35.0	36.0	3

a. Assumed.

If one compares the real rate of the current scheme (36% for companies) to the real rates presented in Table A5.1, the implication is that even in a relatively low inflation environment (3%), a change to a flat non-indexed rate favours very-short and longer-term investment (> 7 years), but only just. If the intention of reforming the CGT system is to promote longer-term investment in higher risk projects with long-term payoffs, then this proposal might not change investment behaviour sufficiently.

The Ralph review also investigates a number of options for stepped capital gains tax rates, similar to those applied in the USA and UK (Treasury 1999, p. 291). Compared to the 30% fixed rate proposal, a stepped tax rate based on the length of time of

investment will further encourage longer-term investment. This will be the case whether indexation and averaging are removed or not. However, stepped rates create problems for the treatment of capital losses. Naturally, taxpayers would seek to use capital losses to offset capital gains taxed at the highest stepped rate first. Unless losses can be quarantined so they can only be used to offset gains generated over a similar period, opportunities for avoidance are created. The current system allows only nominal losses to be used to offset any capital gains, thereby limiting the ability to avoid tax through offsetting.

The final option for CGT put forward by the Ralph review is some form of targeted CGT relief to particular industries or projects. However, the review recognised that this would not help overcome major deficiencies in the entire CGT system (Treasury 1999, p. 299). Ralph acknowledged the benefits of targeted schemes whereby costs to revenue are reduced, and the benefits are potentially large (Treasury 1999, p. 299). The review did not value the revenue cost of introducing such a measure because it would depend on the design of the targeting scheme.

Implications for promoting new technologies and sustainable industries

Clearly, all CGT proposals advocated by the Ralph review will tend to favour longer-term investment relative to the current tax system. However, changing to a 30% fixed rate cannot be expected to change investment behaviour substantially, particularly if the tax rates on other income are also reduced. Analysis by Gavin Tulloch from Sustainable Technologies Australia tends to confirm this view, and suggests that the increased investment generated in a stepped rate CGT system may not be sufficient to promote adequate investment in longer-term, high-technology, high risk projects (Tulloch 1999). This may be related to the fact that major stepped-rate arrangements are directed solely at individual investors, and not (as far as the information in the Ralph report suggests) to company taxpayers.

Many innovative industries are developing new goods and services for which there is a higher risk, longer payback time, but also a potentially higher return (Treasury 1999, p. 298). Investment in such industries is unlikely to produce short-term gains, or income during start-up periods. As a result, a large part of any returns to investing in innovative industries manifest as long-term capital gains. The sustainable energy industry is one of many innovative, high technology industries with the potential to generate large long-term returns. Accordingly, CGT treatment that favours longer-term investment is likely to benefit innovative and sustainable industries, and consequently improve longer-term environmental outcomes and economic performance. This suggests that a flat CGT rate will have little impact on investment in such industries, whereas a stepped rate may well improve the longer-term investment in sustainable industries. However, the reforms may not be sophisticated enough to produce the level of investment necessary to support highly innovative industries. Accordingly, there appears to be some justification for expansion of targeted investment programs either through alteration of capital gains treatment or other effective measures.

Discussion papers available from the Australia Institute

1. Michael Kirby, *Trash Fights Back,* with Max Neutze, Chair's address. Speeches at the public launch of The Australia Institute, 4 May 1994.
2. John Quiggin, *Does Privatisation Pay?* September 1994.
3. George Wilkenfeld, Clive Hamilton and Hugh Saddler, *Australia's Greenhouse Strategy: Can the future be rescued?* February 1995.
4. Clive Hamilton and John Quiggin, *The Privatisation of CSL,* June 1995.
5. John Dargavel, Pat O'Shaughnessy and Clive Hamilton, *Logging and Water: A study of the effects of logging regimes on water catchment hydrology and soil stability on the eastern seaboard of Australia,* November 1995.
6. The Australia Institute, *Citizens in the Marketplace: The implications of competition policy for citizenship*, Papers from a conference held at the Australian National University, 4 December 1995, March 1996.
7. Jamieson House Employment Group, *Redistributing Work: Solutions to the paradox of overwork and unemployment in Australia*, June 1996.
8. The Australia Institute, *What Should Government Do? Auditing the Audit Report*, Papers from a conference held at the Australian National University, July 1996
9. Clive Hamilton, *Mining in Kakadu: Lessons from Coronation Hill*, July 1996
10. Clive Hamilton, Tor Hundloe, and John Quiggin, *Ecological Tax Reform in Australia: Using taxes and public spending to protect the environment without hurting the economy* April 1997
11. Ed Wensing and John Sheehan, *Native Title: Implications for land management* April 1997
12. Clive Hamilton and Hugh Saddler, *The Genuine Progress Indicator for Australia* (summary version) July 1997
13. Tor Hundloe and Clive Hamilton, *Koalas and Tourism: An economic evaluation* July 1997
14. Clive Hamilton and Hugh Saddler, *The Genuine Progress Indicator: A new index of changes in well-being for Australia* October 1997
15. Clive Hamilton and John Quiggin, *Economic Analysis of Greenhouse Policy: A layperson's guide to the perils of economic modelling* December 1997
16. Julie Smith, *Gambling Taxation in Australia* March 1998
17. John Sheehan and Ed Wensing, *Indigenous Property Rights: New developments for planning and valuation* March 1998
18. Julian Disney, John Nevile, John Quiggin and Julie Smith, *Perspectives on the GST Package* September 1998
19. Hal Turton and Clive Hamilton, *The GST Package and Air Pollution: The impact of proposed indirect tax changes on atmospheric emissions* September 1998
20. Quiggin, J., Saddler, H., Neutze, M., Hamilton, C., Turton, H., *The Privatisation of ACTEW: The fiscal, efficiency and service quality implications of the proposed sale of ACT Electricity and Water* December 1998
21. Ann Nevile, *Competing Interests: Competition policy in the welfare sector* June 1999

THE AUSTRALIA INSTITUTE LTD
FOR A JUST, SUSTAINABLE, PEACEFUL FUTURE

The Australia Institute promotes a more just, sustainable and peaceful society through research, publication and vigorous participation in public debate.

The Australia Institute is an independent non-profit public policy research centre. It carries out research and policy analysis and participates in public debates on economic, social and environmental issues. It undertakes research commissioned and paid for by philanthropic trusts, governments, business, unions and community organisations.

The Institute is wholly independent and not affiliated with any other organisation. As an Approved Research Institute, donations to its Research Fund are tax deductible for the donor.

Philosophy

The Institute was established in 1994 by a number of individuals from various sections of the community. They share a deep concern about the impact on Australian society of the priority given to a narrow definition of economic efficiency over community, environmental and ethical considerations in public and private decision making. A better balance is urgently needed.

The Directors, while sharing a broad set of values, do not have a fixed view of the policies that the Institute should advocate. Unconstrained by ideologies of the past, the purpose of the Institute is to help create a vision of a more just, sustainable and peaceful Australian society and to develop and promote that vision in a pragmatic and effective way.

Membership

Membership is a valuable means of contributing to the objectives of the Institute. The annual fee is $75 (with a discount for low-income earners). Members receive the *Newsletter*, published four times a year, and are entitled to Institute papers free of charge on request. They also receive discounted admission to some Institute functions.

If you would like to purchase our publications or support The Australia Institute through membership or donation please contact:

PO Box 72, Lyneham, ACT 2602
Tel: (02) 6249 6221 Fax: (02) 6249 6448
Email: austinst@dynamite.com.au
Website: www.tai.org.au