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Missing the Target
An analysis of Australian Government
greenhouse spending

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Summary

This paper analyses the current levels of spending on greenhouse programs by the Australian Government and aims to:

1. relate this spending to the task of meeting the Kyoto Protocol target;
2. compare the levels of spending in Australia with that of other developed countries;
3. discuss the role of spending on renewable energy technology; and
4. draw conclusions on how spending can best help Australia meet the more demanding targets that are likely to be faced beyond 2012.

The Commonwealth Government has repeatedly claimed that it is spending \$1 billion on greenhouse measures based on the following spending commitments:

- \$180 million to be spent over five years made in 1997; and
- \$796 million to be spent over four years made in 1999.

Analysis of Commonwealth budget figures shows that, after taking into consideration all current departmental greenhouse spending, the Howard Government would need until 2008 to deliver on the claim that it is spending \$1 billion on greenhouse programs. To retain government for this period the Coalition will need to win another two elections. The Government should abandon this unsupportable claim.

The Government's failure to spend, in the timeframe agreed, the money allocated as part of the GST tax deal with the Australian Democrats is the primary reason for its inability to meet the target of \$1 billion.

While a full evaluation of greenhouse spending programs is beyond the scope of this paper, it is clear from the Government's own greenhouse emission accounts that some major spending programs are contributing little to abatement of emissions. It is also questionable whether some of the spending is actually on greenhouse gas abatement. A review of the largest greenhouse spending program, the Greenhouse Gas Abatement Program, concludes that it:

- is biased against innovative technology;
- contributes little to achieving the Kyoto Protocol target; and
- will prove a waste of money in the long term.

The Remote Power Generation and the Alternative Fuels Conversion Programs are also shown to be inefficient and are incorrectly described as being primarily 'greenhouse measures'.

If Australia does reach its Kyoto target, the latest greenhouse emissions accounts suggest that it will be due mainly to fortuitous factors such as the stability of agricultural and waste emissions and a fall in land clearing emissions since 1990. Spending will play only a small part in the overall equation. In view of the significant risk that the target will not be reached, by far the most effective and efficient form of greenhouse spending would be to use it to end land clearing in Australia, an objective to which all governments are, in principle, committed.

A review of spending by developed countries on sustainable energy shows that:

- a number of northern European countries spend relatively high amounts per head on sustainable energy;
- the US and Japan are in a middle position due to very high spending on research and development; and
- Australia lies towards the bottom of the remaining low-spending countries.

An examination of the measures employed by developed countries to reach their Kyoto targets, in particular the role of sustainable energy, shows that several key measures are being used including fuel-switching, voluntary measures, regulations and mandatory standards. Some countries have small carbon taxes, others have developed significant packages of measures directed at particular industries and, for a number of countries, spending on energy conservation is an important tactic.

The development of new forms of renewable energy, however, does not contribute significantly towards reaching the Kyoto targets. Rather, spending on renewable energy in many developed countries is aimed at long-term needs beyond the end of the first commitment period of the Kyoto Protocol in 2012. For example, there is evidence that the US is well placed to respond to the need to reduce greenhouse gases as demonstrated by its substantial research and development spending, state government measures and progressive proposals from Congress.

What is the most useful role that current greenhouse spending can play in Australia? First, it should be used to end land clearing so that Australia can be sure of meeting its first Kyoto target. Second, rather than pursuing ineffective abatement measures aimed at meeting the Kyoto target, spending should be invested with a long term focus, beyond 2012, and directed at:

- well planned research into the development of renewable energy programs that do not exist now; and
- abatement demonstration models across every sector - industrial, agricultural, transport, commercial and residential. The development of such demonstration projects would enable Australia to assess the costs and achievability of emission reductions beyond 2012.

1. Introduction

During the first two years of the Howard Government spending by Commonwealth departments on greenhouse gas abatement programs was around \$22 million a year (Hill 1997, Hill 1998). These outlays were targeted primarily at policy development with some minor expenditure on promotion of voluntary activities through the National Greenhouse Response Strategy (Commonwealth of Australia 1992). November 1997 saw the Prime Minister announce, in support of the Australian position at the Kyoto conference, a package of \$180 million to be spent by departments over five years from 1998-99 to 2002-03, \$36 million a year on average (Hill 1998).

This new funding was intended to provide for policy formation, information gathering, promotion and research and development activities related to greenhouse. It allowed for some spending by the Departments of Industry, Science and Tourism and Primary Industries and Energy and funded the formation of a new Australian Greenhouse Office (AGO).

In mid-1999, as part of the deal reached with the Australian Democrats on the new tax package, the Government committed itself to increased spending on greenhouse (Howard 1999) by initiating five new programs totalling \$796 million to be spent over the four years 2000-01 to 2003-04. Together with the funds committed from 1997, this amounted to spending over the four years of around \$976 million (Hill 2000).

In dealing with claims that it is not doing enough to reduce greenhouse gas emissions or meet the Kyoto target, the Government relies heavily on this expenditure commitment of 'nearly one billion dollars' (Kemp 2002a).¹ The environment minister recently said 'the Government has pumped \$1 billion into greenhouse-gas reduction projects, which were working' (Canberra Times, 2002). Similarly, in May 2002, Minister Kemp claimed that the AGO was 'backed by \$1 billion funding' (Kemp 2002b) and even after the 2002-03 budget the Minister referred proudly to 'overall funding of almost \$1 billion' (Kemp 2002b).

It has been consistently shown that the most economically efficient mechanisms for achieving greenhouse gas reductions include measures such as a carbon tax or an extensive emissions trading system (AGO 1999). However, when faced with pressure from the Democrats during the GST negotiations, the Government opted instead for spending programs. The following section of this paper evaluates the effectiveness of these programs².

¹ It should be noted that despite ruling out ratification of the Kyoto Protocol, the Howard Government claims it is still aiming to achieve the Kyoto target.

² In addition to the spending programs outlined above, the Government has introduced legislation requiring electricity suppliers to source an additional 9,500 GWh of electricity from new sources of renewable power by 2010.

2. Spending on greenhouse programs

2.1 Overall spending levels after the 2002-03 budget

Budget Statement figures detailing the Commonwealth's Environmental Expenditure from 1997-98 through to 2002-03 (Hill 1997, 1998, 1999, 2000, 2001 and Kemp 2002c) show that spending, both undertaken and committed, is significantly less than the claim of \$1 billion dollars. The figures show that actual spending by departments on greenhouse measures in the six years 1996-97 to 2001-02 was \$332.2 million. In the current 2002-03 budget, \$121.3 million has been appropriated for this purpose and forward estimates for greenhouse over the next three years 2003-04 to 2005-06 total \$349.1 million.³

Therefore, assuming forward estimate commitments will be met, actual and committed departmental spending over the ten year period totals \$802.6 million. At the envisaged level of spending it would take two more years, to 2007-08, or twelve years of spending in total, to reach \$1 billion. The Government claim is based on adding together all current spending programs over a twelve year period including five years into the future, beyond the limit of the forward estimates and beyond two more elections. More than half the claimed '\$1 billion' funding is still to be spent or appropriated.

How then do these figures tally with the two tax deal packages of spending on which the \$1 billion claim is based?

Slippage of the tax deal spending programs

The first 1997 package of \$180 million has been more or less implemented. However, 2002-03 budget figures (Kemp 2002c) reveal that spending on the three largest 'tax-deal' programs, originally to be accomplished over the four years 2000-01 to 2003-04, is now to be extended well beyond the farthest forward estimates year of 2005-06.

The agreement with the Australian Democrats stated that the three major programs would be completed by 2003-04 but at current levels of spending, they will not be completed until at least 2008-09. The average spending per year is to be more than halved compared with the original commitment of \$796 million by 30 June 2004 which will now fall short by \$531 million. Overall, the commitment has been comprehensively broken.

Table 1 shows the Federal Government's promised spending on the 1999 tax deal greenhouse programs for the four years from 2000-01. Table 2 shows actual and currently planned spending on these programs over the six years from 2000-01.

³ The addition of spending on a few small programs marked in the environmental expenditure budget statements as 'na' (not available) would make little difference to this total.

Table 1 Promised spending on 1999 tax deal greenhouse programs (\$m)

Program	2000-01	2001-02	2002-03	2003-04	Total to 30/6/04
Greenhouse Gas Abatement Program	100.0	100.0	100.0	100.0	400.0
Renewable Remote Power Generation Program	66.0	66.0	66.0	66.0	264.0
Photovoltaic Rebate Program	4.0	6.0	9.0	12.0	31.0
Alternative Fuels Conversion Program	15.0	20.0	20.0	20.0	75.0
Renewable Energy Development and Commercialisation Program	4.0	5.0	7.0	10.0	26.0
Total	189.0	197.0	202	208.0	796.0

Source: Environmental Expenditure Budget Statement 2000-01 (Hill 2000) Table A6.1

Table 2 Actual and anticipated spending on 1999 tax deal greenhouse programs (\$m)

Program (see Table 1)	2000-01	2001-02	2002-03	2003-04	Total to 30/6/04	2004-05	2005-06	Total to 30/6/06
GGAP	6.8	14.3	39.0	68.0	128.1	58.4	68.0	254.5
RRPGP	5.8	10.8	17.9	16.7	51.2	29.8	25.2	106.2
PRP	18.2	5.6	5.7	2.2	31.7	-	-	31.7
AFCP	10.6	6.5	6.0	7.0	30.1	9.8	14.5	54.4
REDCP	2.1	1.6	6.0	14.0	23.7	2.3	-	26.0
Total	43.5	38.8	74.6	107.9	264.8	100.3	107.7	472.8

Source: Environmental Expenditure Budget Statements 2001-02, 2002-03, Tables A2.1 (Hill 2001, Kemp 2002c).

This drastic fall in spending is confirmed in the 2002-03 Portfolio Budget Statement for the AGO (Treasury 2002) which reveals that appropriations for the AGO total \$113 million compared with \$218 million in the previous year, a fall of almost half or \$105 million⁴.

The Government's claim that it is currently spending almost \$1 billion on greenhouse programs is misleading at best. At the present rate of expenditure it will take around 12 years, to 2007-08, for the Government to spend \$1 billion on greenhouse programs. By including expenditure much further into the future than is customary in order to support its claim, the Government has reneged on its original agreement with the Democrats and has contravened the spirit, if not the letter, of the Charter of Budget Honesty which seeks transparency and comparability in government accounts. It is disingenuous of the Government to continue to make this claim.

2.2 Effectiveness of spending

The previous section calculated that, at present, the Commonwealth Government is spending around \$120 million per annum on greenhouse related programs. While this level of spending does not equal the \$235 million per annum spending claimed by the Government, it is nevertheless important to analyse the effectiveness of the expenditure.

Approximately 75 percent of the Federal Government's greenhouse-related expenditure is confined to the six programs listed below, the first five of which arose from the 1999 tax deal with the Australian Democrats.

1. Greenhouse Gas Abatement Program (GGAP);
2. Renewable Remote Power Generation Program;
3. Alternative Fuels Conversion Program (previously known as the Compressed Natural Gas and Liquid Petroleum Gas Vehicle Conversion program);
4. Photovoltaic Rebate Program;
5. Renewable Energy Development and Commercialisation Program; and
6. Greenhouse Challenge.

The remaining 25 percent of spending amounts to about \$30 million a year and funds 16 different greenhouse programs in AGO and the Department of Industry, Tourism and Resources (Kemp 2002c). These 16 programs cover various aspects of policy development, information collection and dissemination, promotion of voluntary measures, research and the administration of the mandatory renewable energy target. In financial terms, they are mostly very small programs.

⁴ The AGO accounts for almost all departmental greenhouse spending; the Department of Industry, Tourism and Resources accounts for only a few million dollars per annum.

Most of these small programs, such as the provision of public information and promotion of basic scientific data collection and policy development, are unlikely to make a significant difference to the levels of greenhouse gas emissions in Australia. Their work is, however, helpful and constructive and it is of concern that there is no funding commitment to almost all of them beyond the current year, 2002-03 (Kemp 2002c). This question mark over their futures undermines the effectiveness of much of their work.

The effectiveness of greenhouse spending in Australia therefore hinges on the success of the six major programs and, given its claims about the crucial role of its spending, the Government will be judged accordingly. These programs will now be analysed in detail, with particular emphasis on GGAP.

2.3 Greenhouse Gas Abatement Program

Under the original deal with the Australian Democrats, the Government made a commitment to spend \$400 million on this program over the four years 2000-01 to 2003-04 (Howard 1999). However, the environmental expenditure budget statements (Hill 2000, 2001, Kemp 2002c) show that actual spending has been slow to get under way. It will now take until at least 2007-2008 for the \$400 million to be spent. The result is that the amount of money spent annually is reduced. In addition, the necessity to devise replacement programs is postponed.

Information on GGAP is set out on the AGO website (AGO 2002a). The primary objective is to abate greenhouse emissions in order to help achieve the Kyoto Protocol emission target for Australia. Under the scheme, potential emitters receive payments for measures that result in future emissions abatement. Abatement, in this instance, means emissions lessened in the five Kyoto Protocol target years of 2008 to 2012. Sink activities, such as planting new forests, are not supported. Abatement projects will only be funded if they involve abatement of more than 250,000 tonnes of carbon dioxide a year. The AGO states that it is seeking to fund projects where the cost of abatement is below \$16 a tonne with a result that projects are chosen primarily on the basis of cost-effectiveness, that is the lower the cost of abatement per tonne the better. Under the guidelines, five criteria may be used to assess proposals in addition to their abatement potential:

1. use of innovative technology;
2. employment creation;
3. spending in remote, rural or regional Australia;
4. inducement to other investment; and
5. helping to achieve ecologically sustainable development.

Proposals are assessed by the AGO and a short list then goes to the Minister for the Environment who decides which projects are to be funded. The projects chosen in the first round, announced in early 2001, are briefly described on the website (AGO 2002a).

Almost all project funds went to mining or secondary industry.

There are several reasons why GGAP is an ineffective and inefficient mechanism for achieving the first Kyoto target.

Too small to make a significant difference

The GGAP program budget is too small to contribute significantly to meeting Australia's Kyoto targets due to the way spending is applied.

Current projects are achieving a cost per tonne of emissions avoided of \$6-8. Assuming an average of \$7 for all future projects, total spending of \$400 million would achieve a reduction over the five years of the Kyoto target period of 67 million tonnes, or about 13 million tonnes per year. This calculation confirms the projections based on Kyoto accounting rules (AGO 2002b) and published by the AGO in September 2002 which show that GGAP is expected to contribute a reduction of 11 million tonnes a year.

Set against Australia's overall target of about 540 million tonnes, and the much larger challenges set by the expected rise in energy emissions of 119 million tonnes by 2010, it is clear that GGAP will make only a small contribution to reaching Australia's target.

Better ways of spending

If the Government is determined to rely on spending to meet Australia's Kyoto target rather than on the introduction of a carbon tax or trading regime, there are more effective programs available than GGAP.

For example, funds could be used to provide financial support to improve land use practices. Other environmental benefits are also associated with reduced land clearing. It has been evident for some years now (see for instance Australia Institute 1997, 1998) that this is by far the cheapest way, at around \$1-2 a tonne, of reducing emissions.⁵ As discussed below, bringing land clearing to a halt in net terms would make a massive contribution towards achieving Australia's target, sufficient in itself even if other measures failed. Reducing land clearing emissions is the key to meeting Australia's Kyoto targets.

Spending at the GGAP level would be adequate to provide the incentive element of a package of measures to stop net land clearing. For instance, acquisition of the 400,000 hectares of land that are cleared in Australia each year, at a generous average value of \$40 a hectare (ABARE 1995) (most of the land is extremely marginal), would cost only \$16 million a year. All governments in Australia are committed to ending net land

⁵ In essence the outcome at Kyoto was that Australia won the only significant increase from 1990 emission levels on the basis that it was a high-cost emission-reduction country. At the same time, through a special clause, it achieved land clearing emissions included in its 1990 baseline, emissions which are low cost to remove and falling, which meant that Australia was not a high-cost emission-reduction country.

clearing (see for instance Liberal Party 1998 and ALP 2000).

Unreliable 'business-as-usual' forecasts

Programs such as GGAP, which pay firms to cease certain customary conduct, contain a fundamental weakness in that they rely on the firms' own statements about 'business-as-usual' plans. This is an inherently unreliable and possibly biased foundation for analysing potential emissions.

The payment of \$5 million to the Gove alumina smelter in the Northern Territory (NT) is an example. This project is based on the building of a gas pipeline from the NT gas fields to Gove and the payment was made against the reduction of emissions as a result of switching from burning oil to burning gas for electricity on site. Given the long term availability of gas in Australia and the distinct possibility of long-term higher global oil prices, it could be argued that the underlying economics of the world energy market would have prompted the shift from oil to gas regardless of the availability of GGAP payments.

A similar incident occurred in the United Kingdom where a spending program to boost an emissions trading scheme in effect paid firms in retrospect for emissions reduction. Independent analysis subsequently showed these claims to have been fraudulent in many cases (Guardian Weekly 2002). Unreliable claims on emission reductions are discussed in further detail below in relation to the Greenhouse Challenge program.

Victim-pays approach

A fundamental problem associated with schemes such as GGAP lies in the fact that they are essentially based on a 'victim pays' approach to pollution wherein the polluters are paid by the community to reduce their emissions. There are two main objections to the victim pays rather than the 'polluter pays' approach.

1. It results in the polluter threatening to pollute unless rewarded for abatement and thus creates an incentive for the polluter to maintain a pollution potential in order to continue to receive payments. It does not furnish the wider incentive to reduce pollution provided by a polluter pays approach.
2. It is generally inequitable: those that cause the problem receive payment because of their actions.

There may be particular circumstances where the victim pays approach is justified such as the need to overcome special equity or industry adjustment problems, fund research, commercialise technology or when no other feasible option exists. But even if GGAP has provided some of these benefits, it is not designed primarily for this. Its main objective is simply abatement.

Biased against innovation

Only one of the five lesser objectives of the GGAP program is concerned with innovative

technology. Thus any benefits from GGAP in terms of research, development and demonstration relating to renewable energy, energy efficiency or demonstrating low emissions reduction costs, are mostly accidental given the design of the program.

Furthermore, the design of GGAP is inherently biased against innovative technology or innovative demonstration of emission reduction. Grants are based on firms proving a very high probability of reduction against the claimed ‘business-as-usual’ emissions and having to repay the funds if targeted emission levels do not occur. Consequently, any pioneering or speculative technology or new area for reduction is unlikely to receive support under the GGAP program.

Political decisions

Another major problem with GGAP is the opportunity to distort spending for political purposes. According to information on the AGO website (AGO 2002a) projects are assessed for funding and a short list is provided for a final ministerial decision. Until the recent abolition of the AGO’s Ministerial Council, this meant that the Ministers for Environment, Industry and Agriculture made the final decision.

Since the abolition of the Ministerial Council, the decision now rests with the Environment Minister although advice to him is subject to prior interdepartmental consultation. The combination of a political decision-making process with the varied objectives of the GGAP program is of major concern. Given that GGAP’s objectives include spending in remote, rural and regional Australia and the promotion of employment, ample scope exists for directing spending decisions away from a focus on abatement.

Program alternatives

As noted above, if spending is to be the main weapon against greenhouse, funds would be best directed to:

- the most efficient form of paying for abatement, that is, ending land clearing;
- innovative technology research, development and commercialisation; or
- projects aimed at the efficient reduction of emissions in all relevant sectors.

Judged purely as an abatement program, GGAP is too small to have a significant effect on overall emissions in 2008-12. Low-cost emission reductions, the ‘low-hanging fruit’ currently being funded by GGAP, would probably have been implemented by the emitters in any case. In these circumstances, GGAP would have been entirely unnecessary and the funds could have been much better spent on something of real, long-term value. If problems arise in meeting the Kyoto target, other larger measures will need to be taken. In the longer term a carbon tax, tradable emission permits or other forms of regulation will be needed to lower Australia’s emissions

Because GGAP is focused on predictable low-cost abatement (with a range of subsidiary

objectives unrelated to greenhouse), it is ineffective at promoting new technologies and commercialisation. While it has funded some useful demonstration projects, these are limited in number and have arisen incidentally rather than by design. A method of using GGAP funds more efficiently would involve funding the research and development of renewable energy and energy efficiency technology directly. However, in light of the rapid shrinking of Government spending on existing programs in these areas, this would merely amount to cost-shifting and GGAP would cease to provide any additional funding to greenhouse issues.

An alternative avenue for funding would be to replace GGAP with a Greenhouse Gas Abatement Demonstration Program (GGADP) with a single focus aimed at devising, from real world projects, models that demonstrate efficient ways of reducing greenhouse gas emissions for every significant sector. Demonstrator projects could showcase the application of renewable energy, greater energy efficiency, alternative infrastructure forms and application of other technologies such as agricultural methane reduction. Models could be developed with the Government holding and making freely available all the know-how and intellectual property relating to them.

The gathering of real-world demonstration projects from all sectors would also illustrate the real costs of imposing a carbon tax or an auctioned permit system and thus would provide a better picture of emission reduction costs. The result would be a comprehensive 'bottom-up' model as distinct from the often far-fetched economy-wide ('top-down') models currently used for most economic modelling (Hamilton 2001). An invaluable tool for future greenhouse policy formation and action would be created. The effect would be that, once the prospect of wide-ranging measures to reduce emissions becomes clear, the practical models under Australian conditions would exist to facilitate widespread implementation. The only significant benefit from GGAP so far would thus be expanded.

2.4 Alternative Fuels Conversion Program⁶

This program was established to give financial support to the conversion of conventionally fuelled buses and commercial vehicles weighing over 3.5 tonnes to Compressed Natural Gas (CNG) and Liquid Petroleum Gas (LPG) (Hill 2000). It offers financial support for the conversion, upgrade and purchase of new vehicles to take CNG and LPG and was originally to cost \$75 million over the four years to 2003-04. It has subsequently been estimated that the funds are now likely to be spent over eight or nine years to about 2009 (Kemp 2002c).

An evaluation of this program must consider its effectiveness in:

- reducing greenhouse emissions;
- providing demonstrations of such technology; and
- introducing a cost-effective way of reducing Australia's greenhouse emissions.

⁶ Previously known as the Compressed Natural Gas and Liquid Petroleum Gas Vehicle Conversion Program

The AGO does not provide sufficient information to identify the following:

- the division of spending between the conversion and upgrade of existing vehicles;
- the number of vehicles that have been funded; or
- the amount of emissions that have been avoided.

It appears that the major component of this program is the conversion of existing bus fleets. However, it is not possible to determine the cost per tonne of emissions avoided.

Information on the cost-effectiveness of the program is found in Beer *et al.* (1999) which examines the environmental performance of a range of alternative fuels compared with standard diesel. The study shows that the benefits of the program are marginal at best and arise almost entirely from the urban air quality advantages of CNG and LPG compared with diesel. Beer *et al.* (1999) show that, using a full life-cycle analysis, CNG and LPG in heavy vehicles give rise to greenhouse emissions that are around 80 per cent to 90 per cent of standard diesel. This small saving only occurs, however, with new vehicles designed to take CNG or LPG. There is no greenhouse benefit in the conversion of existing vehicles, a process that has been heavily funded under the program.

Furthermore, with respect to CNG, the benefits associated with emission reductions for new vehicles are based on optimistic assumptions about the CNG production process in Australia. In particular, they rely on the use of very low estimates of fugitive emissions (Beer *et al.* 1999). Consequently, this program offers only minor greenhouse benefits and is therefore highly unlikely to be cost effective. The study does, on the other hand, show very large urban air quality benefits from using CNG and LPG compared with diesel. On this basis the program may well be justified, but such expenditure should not be classified under greenhouse programs.

In essence this program is an urban air quality improvement program propelled by concerns about air pollution from heavy diesel vehicles in urban areas and appears to be a case of the Government describing spending as being on greenhouse when it is not. This type of program, and the relevant expertise, has resided in the past within the area of the environment department concerned with air pollution. It does not appear primarily related to the objectives of the AGO and should therefore be removed from its responsibility. The inclusion of its \$75 million in greenhouse spending is misleading.

2.5 Renewable Remote Power Generation Program

Under this program the Government will meet up to 50 per cent of the cost of converting current or prospective off-grid diesel-powered electricity to renewable energy technologies (AGO 2002c). The program is remarkable for its size given the smallness of the problem it addresses and the size of other greenhouse spending. It is the second largest greenhouse program after GGAP and, even after slippage, it dwarfs all the remaining greenhouse programs. Yet it addresses an extremely small component of total power generation in Australia.

The very small scale of remote power generation severely limits any demonstration of the wider benefits for renewable energy. The small amounts of power generated by the sources in question ensure that in terms of dollars per tonne of emissions abated this will not be an efficient program.⁷

According to the original environmental expenditure statements, 'up to \$264 million' of funding is to be provided over the four-year period to 2003-04 (Hill 2000). A substantial contribution is thus made to the 'almost \$1 billion over four years' of spending on greenhouse originally claimed by the Government. In the 2001 Budget, however, this had slipped to \$179.3 million over the five years to 2004-05 (Hill 2001). The 2002 Budget now indicates spending will be stretched to around 2009 (Kemp 2002c).

The program has four objectives. The first and third of these are to help provide remote users with an effective electricity supply and to assist with the energy infrastructure of indigenous communities. Assisted power schemes may still meet the objectives while containing a substantial element of diesel and these two goals have nothing to do with greenhouse. The other two objectives do relate to greenhouse abatement, namely assisting the development of the renewable energy industry and achieving long-term greenhouse emissions reductions.

Projects funded under this program need not involve a wholesale replacement of diesel, and remote users may be individual households. Pastoral properties are the main beneficiaries, photovoltaics (PV) the main renewable technology and funding covers not only the renewable technology itself (such as the PV panels), but design, management, installation and the costs of inverters, batteries and other specialised equipment for remote users (AGO 2002c). It is clear that a comprehensive power upgrade for a remote user requires very little funding to be spent on renewable technology at the generation end.

It would appear that this program was designed more to help with maintaining power supply to remote users than to reduce greenhouse gases although it could be claimed that the PV industry receives some assistance from it. However, this could be done much more effectively if the funding were devoted to subsidising uptake of PV in a quite different but much bigger market, the grid-connected electricity system.

This remote power program in effect uses funds very inefficiently on a quantity of equipment in tiny, high-cost atypical operations where a few demonstration examples would be much more useful if the overall objective is to reduce greenhouse emissions. There may well be an equity case for providing financial support so that remote power users are able to have an effective power supply, thus meeting the first and third objectives of the scheme, but such expenditure, once again, should not be classified as funding for greenhouse abatement. The effectiveness of the program is limited because of its mixed objectives and very small scale project focus. Only a minor part of the scheme is genuine greenhouse spending. Its focus should be altered to concentrate totally on greenhouse gas abatement.

⁷ The AGO has no information available on the cost effectiveness of this program.

2.6 Photovoltaic Rebate Program

The tax deal with the Democrats included a \$31 million program to provide rebates for households and communities that install photovoltaic (PV) panels to generate electricity (Howard 1999; Hill 2000). The scheme was to run for the four years, 2000-01 to 2003-04. In fact there was such an enthusiastic uptake that more than half the funds were spent in the first year. Spending of only \$5.7 million is planned for 2002-03 with \$2.2 million for the last year, 2003-04. No further funds are committed.

The development of PV is an area where Australia is a world leader and potentially a large global industry opportunity exists. However, Japan and some European countries are beginning to provide substantial support for the uptake of PV thus threatening Australia's position as an early PV leader (see, for instance, Japan 2002, United Kingdom 2001 and IEA 2000). Various AGO programs, for example those aimed at renewable energy development and remote power, provide both direct and indirect support to the PV industry but with the lapse of the household rebate scheme after 2003-04, backing for the uptake of PV in the main market will fall.

2.7 Greenhouse Challenge

The environmental expenditure statement in the 2002 Budget discloses \$5.8 million of spending for the year on the Greenhouse Challenge program (Kemp 2002c). This program promotes voluntary emission reduction by industry through agreements with firms and industry associations (AGO 2002d). Its activities involve information and consciousness-raising and, in addition, it provides a framework for measuring emission reductions in relation to business-as-usual.

Some figures have been published on claimed emission reductions under Greenhouse Challenge and there have been two independent reviews of the program. The first, by consultants George Wilkenfeld and Associates Economic and Energy Analysis, was published in 1996 (Wilkenfeld 1996) and the second, by the Senate Standing Committee on the Environment under the enquiry title 'The Heat Is On' (Senate 2000), was published in 2000. These and other aspects of Greenhouse Challenge are discussed extensively in Hamilton (2001).

The evidence suggests that the Greenhouse Challenge program has probably played a valuable role in raising industry awareness but its claimed emission reductions are likely to have been overstated. The unreliability of the claims derives from heavy reliance on the advice given by firms as to the nature of emissions under 'business-as-usual'. Thus emission reductions that would have taken place anyway are instead attributed to actions resulting from the Greenhouse Challenge program.

In addition, under Greenhouse Challenge, some firms have been given valuable publicity and government endorsement that may have been undeserved. In order to correct these shortcomings, it will be necessary to devise credible industry and business standards and benchmarks so that a tenable measure of emissions under a 'business-as-usual' scenario can be produced.

Greenhouse Challenge should be continued, if not enlarged, provided its activities with respect to emission reductions are restructured so that it can deliver credible measurements of the reductions that have been achieved. It is of concern that there is no commitment in this year's budget papers to continuing this program beyond the current year (Kemp 2002c).

2.8 Renewable energy programs

The tax deal with the Democrats provided for an additional \$26 million to be spent over four years under the title Supporting Development and Commercialisation of Renewable Energy (Hill 2000). Currently this program, along with the Renewable Energy Commercialisation Program (RECP) and the Renewable Energy Equity Fund (REEF), comprise the three main renewable energy assistance programs, with expenditure totalling about \$16 million in 2002-03 (Kemp 2002c). REEF spends about \$3 million a year on buying equity in renewable energy firms.

RECP is due to come to an end in 2002-03. Funding for renewable energy during the subsequent two years will come entirely from the remainder of the \$26 million program. The outcome will be very little additional spending overall from the tax deal suggesting that it is providing cover for a cost-shift and being used to make up for the cessation of RECP.

In recent years there has been a range of small programs administered by both the environment portfolio (now through the AGO) and the industry department (see Kemp 2002c), supporting renewable energy research, development, demonstration and commercialisation. Support for the growth of renewable energy is a vital greenhouse and industry issue for Australia. Given its potential opportunities, it should be a major greenhouse spending priority coordinating R & D assistance with demonstration and commercialisation programs.

The multiplicity of programs in the past, the absence of comprehensive demonstration programs (as recommended above in relation to GGAP), and the phasing out of the PV support scheme suggest that a major coordinated recasting of support for renewable energy is needed. Funding for renewable energy research, development, demonstration and commercialisation needs to be conducted on a long-term, coordinated basis and driven by long-term planning with respect to Australia's renewable energy needs. There is no evidence of this at the moment.

2.9 The role of spending in meeting the Kyoto target

The Government has published details of Australia's greenhouse gas emissions according to Kyoto accounting rules which cite estimates of how Australia will meet its Kyoto target (AGO 2002b). The figures reveal that, despite an increase in energy emissions (mainly transport and electricity generation) of about 40 per cent, it is expected that Australia will overshoot the target by only 3 per cent. That is, Australia's emissions will rise to 111 per cent of their 1990 levels rather than the 108 per cent permitted under the Protocol. This gap amounts to approximately 16 million tonnes of carbon dioxide

equivalent.

Several major factors account for the fact that Australia may approach its Kyoto targets despite the substantial rise in energy emissions. These factors include the following:

- the overall 8 per cent increase allowed Australia under the Kyoto agreement, a contribution of approximately 40 million tonnes;
- the fall in emissions from land clearing through a decline from 107 million tonnes to 61 million tonnes, a contribution of some 46 million tonnes; and
- emissions from other non-energy sources such as agriculture and wastes which are expected to be stable between 1990 and 2010

The overall rise in emissions is less than that originally forecast under ‘business as usual’ scenarios and the Government has attributed the credit for achieving this result to its spending programs, mandated renewable energy targets and voluntary schemes (Kemp 2002a). GGAP activities are calculated to reduce emissions by 11 million tonnes; all other measures are expected to contribute reductions amounting to 48 million tonnes (Australia, 2002).

Before assessing these claims, three points must be made:

- 1) It is doubtful whether these measures, other than GGAP, will contribute emissions reductions of 48 million tonnes. The breakdown of the effects of the measures are set out in Australia’s Third National Communication (TNC) to the IPCC (Australia 2002), and some of them are highly questionable, if not wildly optimistic, guesses. For instance the Greenhouse Challenge program is listed in the TNC as the single biggest contributor but this is a program that is yet to develop credible means of measuring claimed emission reductions. Most reductions are to come from voluntary actions by a vast array of private and public sector bodies. The Commonwealth is providing neither spending nor regulatory support to ensure the targets are met.
- 2) The Government’s major spending programs are contributing very little, or nothing, to the reductions.
 - GGAP is expected to contribute only 11 million tonnes a year, or about 2 per cent of all emissions.
 - The Renewable Remote Power Generation Program is contributing nothing to abatement.
 - The Alternative Fuels Conversion Program has no reductions attributed to it but is included with the Compressed Natural Gas Infrastructure program. Together they are estimated to reduce emissions by only 0.5 million tonnes.
 - No abatement is claimed for the Photovoltaic Rebate or Renewable Energy Development and Commercialisation programs.

- 3) According to Gwen Andrews, the former head of the AGO who left as recently as May 2002, Australia is in fact on track to exceed its Kyoto target by twice the projected amount (Australian Financial Review 2002). She stated that the most recent Australian forecasts showed soaring emission figures from electricity and liquified natural gas production. As a result, total emissions will be pushed to 114 per cent of 1990 levels, or 6 per cent above the Kyoto target rather than the 3 per cent claimed by the Government. The information from Gwen Andrews indicates a gap of 32 million tonnes rather than the 16 million tonnes forecast, perhaps optimistically, by the Government.

The recently published Kyoto greenhouse accounts, the TNC and Andrews' information confirm the conclusions that:

- most of the Government's spending on greenhouse is a waste of money with respect to greenhouse gas abatement aimed at meeting the Kyoto target;
- a more effective way of spending money on reducing greenhouse emissions, in fact the key to meeting the Kyoto target, is to reduce land clearing. This would provide major greenhouse and other benefits to Australia; and
- a key role for Government spending is to prepare Australia for the period beyond 2012 by focusing on ways to achieve the much greater reductions that will eventually be needed.

3. How Australian spending on sustainable energy compares

3.1. Introduction

This section reviews spending on sustainable energy in developed countries. The primary purpose of this analysis is to provide some context for the level of expenditure on sustainable energy in Australia. The difficulties associated with comparing the overall impact of different levels of spending by different governments, and by different levels of government, indicate that the following results should be considered to be suggestive rather than conclusive. But, given the large difference between the biggest spending countries and Australia, it is quite clear that Australia's level of spending is low by international standards.

- The main sources of information for this section are the Third National Communications (TNCs) to the United Nations Framework Convention on Climate Change (UNFCCC) and International Energy Agency (IEA) publications.
- TNCs were considered reliable sources of information on overall spending levels because:
 1. their exposure is international;
 2. for most industrialised countries, government spending levels do not have the profile they have in Australia as a greenhouse measure; and
 3. where other data were used they supported TNC information.
- Spending data from some developed countries are not available
- All figures presented are in Australian dollars per capita to assist with comparisons.
- Currently published exchange rates are used.
- Conversion using current exchange rates gives only an approximate guide but it is adequate for the purposes of this report.
- The term 'sustainable energy' has the advantage of being easier to define than the vaguer 'greenhouse spending'. The definition of sustainable energy covers:
 1. what is likely to be the key category of long-term spending and is sufficiently broad to include the wide range of innovative approaches to greenhouse abatement; and
 2. renewable energy development and energy conservation and includes the cost of tax concessions (tax expenditures) where these are recorded in country data.

3.2 Country analyses

Canada

Information on Federal Government sustainable energy spending can be found in Canada's TNC (Canada 2002a) and on Canadian government websites (Canada 2002b). In these sources, the Canadian Federal Government claims that it is committed to funding climate change activities worth C\$1.1 billion over a five year period from 2000. However, it is difficult to determine exactly what programs make up this expenditure although it is clear that a substantial portion is not related to sustainable energy. A comprehensive list of spending initiatives is provided in a speech made in November 2001 by the Federal Minister for Natural Resources, Ralph Goodale (Canada 2002b).

The minister outlines spending totalling C\$506 million for sustainable energy activities (Canada 2002b) covering:

1. the Sustainable Development Technology Foundation;
2. funding for activities by Canadian municipalities;
3. renewable energy use by federal government;
4. energy efficiency technology development;
5. initiatives in the transport, building and industrial sectors; and
6. new energy technology development.

Expenditure of C\$506 million on sustainable energy, distributed over the five years of the current Canadian government commitment period, equals A\$4 per capita per year.

A review of Canada's TNC (Canada 2002a) and provincial government websites (Canada 2002c) indicates that at least one provincial government, Quebec, has an expenditure program aimed at funding renewable energy production that goes beyond developing unsustainable, large-scale hydroelectric resources. It appears that most activities addressing climate change in other provinces are of an informational, promotional and voluntary nature.

Denmark

Denmark has a comprehensive range of measures aimed at encouraging the generation of energy from renewable sources including a tax on carbon dioxide emissions, green certificate trading and the requirement for a proportion of electricity to come from wind (IEA 2000, pp. 139-147; Steen 2000). Financial support is also provided for research into and development of renewable energy technologies, integrated technologies and systems involving improved efficiency and energy conservation (IEA 2000). The Danish Government has historically directed most of its support to wind and biomass but has recently expanded its support for photovoltaics. Government expenditure on renewables

and energy conservation R&D is around US\$27 million (IEA 2000, pp. 276, 282).

Energy efficiency is promoted through a reduced tax on carbon dioxide for those emitters that carry out energy efficiency measures. The Danish government provides direct funding support for energy-efficient building components and equipment including windows and gas-fired boilers in houses. In addition around US\$7.1 million is spent on assisting pensioners with energy efficiency upgrades (IEA 2001a).

Danish electricity generators are subject to caps on carbon dioxide emissions with those that exceed their cap required to pay DKr40 (about A\$10) per excess tonne. The funds thus collected are used for energy saving measures (Steen 2000).

Few figures are available on the total size of budget allocations. Data is available for the Electricity Saving Trust, established in 1997, which annually directs a total of around DKr90 million (A\$23 million) to assist in the conversion of electric heating systems to district or gas heating. Although representing only a portion of total spending by Denmark on sustainable energy, the above budgets for these programs and measures are equivalent to around A\$15 per capita per year.

European Union

Although the European Union (EU) has its own spending programs, its TNC (EU 2001) indicates that its activities primarily comprise policy directives for its members such as gaining member commitments for activities, coordinating member activities and carrying out research.

Finland

According to its TNC (Finland 2001), Finland has implemented a comprehensive set of measures aimed at achieving its Kyoto target, including an extensive range of budget allocations for renewable energy and energy efficiency. Expenditure items include subsidies for:

- industrial firms investing in ‘environmentally-friendly’ energy investments, especially new renewable energy technology;
- energy efficiency in renovating buildings;
- electricity generated by wind, wood-based fuel and small-scale hydro implemented by means of an ‘operational tax subsidy’ or tax concession; and
- the use of forest biomass for energy.

Current and planned spending levels on sustainable energy by the Finnish Government are detailed in Table 3.

Table 3 Finnish Government spending on renewable energy and energy conservation

Expenditure Program	Expenditure 1999 (€ million)	Expenditure 2010 (€ million)
Research and Development - energy use and conservation	35	35
Promotion of energy conservation	5	13
Investment assistance for renewable energy source	20	33
Renovation of heating residential buildings	5	17
Tax subsidy (concession) for renewable energy electricity generation	35	60
Total	100	158

Source: Finland's Third National Communication to the UNFCCC, at www.unfccc.int/resources/docs/natc/finnc3.pdf, page 111

The Finnish Government's 1999 expenditure of €100 million on sustainable energy is equivalent to about A\$34 per capita in that year.

France

According to its TNC France has adopted a wide variety of complementary measures on climate change under the National Program to Prevent Climate Change (NPLCCC) (France 2001). As part of this, the Agency for Environment and Energy Management (ADEME) has a budget of €137 million a year for energy management and renewable energy development projects orientated towards climate change mitigation. This is equivalent to around A\$4 per capita per year.

The National Communication shows that ADEME jointly funds a number of programs with agencies that are governmental (such as regional government departments) or quasi-governmental (such as the government-owned electricity monopoly Électricité de France). Accordingly, it is likely that expenditure by ADEME understates the total sustainable energy spending by government in France.

Germany

Germany's main climate change policy instrument is a variable tax on fossil fuel use (IEA 2000, pp. 149-161) with the revenue being directed primarily towards reducing taxes on labour in order to encourage employment. A portion funds the promotion of renewable energy. Mandated requirements comprise the chief mechanism for supporting renewables (IEA 2000).

In terms of budget support, there is a program costing DM200 million a year which promotes research and development of energy conservation technologies and renewables. Its timeframe extends from 1999 to 2003.

The German Federal Government is also implementing the '100,000 roofs solar power program' which runs from 1999 to 2005 and is funded with a total of DM1.1 billion. An additional DM1 billion has been allocated to facilitate the provision of low-interest loans for the installation of thermal solar collectors and energy conservation in buildings.

On an annual basis, total federal German budgetary support comes to about DM650 million per year based on the above figures equating to about A\$7 per capita per year.

Japan

According to its TNC, the Japanese Government is providing funding to some significant sustainable energy initiatives although actual budgetary expenditure is not available (Japan 2002). For example, tax deductions and special depreciation allowances are available for energy-efficiency equipment and capital grants of up to 15 per cent can be awarded for the installation of cogeneration equipment. In addition, the Japanese Development Bank, a quasi-government agency, provides low-interest loans for 'eco-care' buildings (IEA 2001b).

The Japanese government is second only to the US, and far above any other country, in its spending on research and development with respect to energy conservation and renewables. The spending total of US\$693 million per annum (IEA 2000, pp. 276, 282) equates to approximately A\$10 per capita per year.

Netherlands

According to its TNC, the Netherlands Government intends to spend €227 million a year, either directly or through financial incentives such as tax concessions, to support renewable energy and energy conservation (Netherlands 2001). €91 million of this is budgeted for residential sector measures including combined heat and power schemes and solar energy. €136 million is to be directed towards the commercial and industrial sector.

The funding for these measures derives from revenue generated by the Netherlands' energy tax. Electricity produced from renewable sources is zero-rated under the energy tax, providing additional support. There appears to be little information on the cost of this tax expenditure. The figure of €227 million a year equates to around A\$26 per capita per year.

New Zealand

The New Zealand Government's major initiative on energy efficiency comes under the National Energy Efficiency and Conservation Strategy (NEECS) and is being implemented by the Energy Efficiency and Conservation Authority (EECA). EECA has been allocated funding of NZ\$9.7 million in 2001-02 and NZ\$12.8 million in 2002-03

(IEA 2001c). New Zealand's TNC also indicates interest in renewables such as wind power but there are no figures on budgetary support for renewables (New Zealand 2001).

New Zealand's Kyoto ratification package is expected to provide subsidies for renewables (especially wind) of up to NZ\$16 million a year over the next four years. In addition, the government intends to establish a fund to assist companies striving to cut emissions through greater efficiency. Based on the above figures, the New Zealand government is currently providing budgetary support in the order of at least NZ\$12.8 million per year. Depending on future budget allocations to EECA and the speed at which the new subsidies to renewables are rolled out, this may increase substantially. Current annual expenditure is equivalent to A\$3 per capita.

Norway

According to Norway's TNC, in 2001 the government provided budgetary support for energy efficiency and renewables, excluding large hydro, of about NOK500 million (around A\$125 million) (Norway 2002). This included both direct spending and indirect incentives. Wind power support was a major focus and was assisted by a tax concession amounting to around NOK0.1 per kWh (about 2 cents Australian per kWh). The figure of NOK500 million a year equates to approximately A\$27 per capita per year.

Sweden

According to Sweden's TNC, there are a number of budgetary programs designed to support sustainable energy (Sweden 2001).

A program for climate change investments of SEK990m (about A\$200 million) over the current three year period to 2004-05 appears to have replaced a program for 'near-term' gains in sustainable energy (conservation and efficiency) of SEK3.1 billion over the five years to 2002 (or about SEK620m a year).

A long-term energy research and development program with expenditure over the six years to 2003 of SEK5.3 billion (or about SEK880m a year) is also in place. These total SEK1.5 billion to 2002 and SEK 1.2 billion to 2005 respectively.

The Swedish Government runs several major spending programs with strong climate change elements. These include programs to assist the Swedish car industry to develop environmentally friendly cars and municipalities to fund buildings with energy-efficiency objectives. However, these do not appear to be essentially climate change programs even though elements could be categorised as sustainable energy initiatives. On this possibly conservative basis, Sweden spends around A\$31 per capita a year on promoting sustainable energy.

Switzerland

Spending on energy efficiency and renewable energy in Switzerland is by way of federal government grants to the cantons.

Switzerland's Energy 2000 Plan, implemented over 1991-2000, spent CHF558 million but it is not clear what proportion of the total went towards energy efficiency or renewables.

A two-year government program in 1997-99 spent CHF64 million (A\$75 million) to fund energy savings and renewable energy in the building sector (Switzerland 2001). This is the only specific reference to expenditure on sustainable energy mentioned in Switzerland's TNC and is equivalent to A\$5 per capita a year.

United Kingdom

According to its TNC, over the years 2001-04 the UK intends to spend £260 million across a package of support measures for sustainable energy. An additional £100 million is to be provided in capital grants (United Kingdom 2001). A large proportion of these funds will be directed towards rooftop solar photovoltaics, demonstration wind power and biomass projects.

Measures in the sustainable energy package include:

- exemptions from a climate change levy (a fossil fuel energy tax) for energy used in 'good quality' combined heat and power schemes, for example
 1. a total exemption from the levy for renewable energy development; and
 2. an 80 per cent exemption where energy-intensive firms meet challenging energy-efficiency goals;
- tax incentives (enhanced capital allowances) for energy-efficiency investments by firms (IEA 2000, pp. 171-178).

An amount of £215 million has been allocated over five years to help kick-start a voluntary emissions trading scheme. Initially, the funds will assist firms to participate in the scheme through emissions reductions and exemptions from the climate change levy. It is difficult to determine on the basis of the available information to what extent this spending supports energy efficiency, renewables, fuel switching or industrial restructuring.

The government has also announced some very large capital investment schemes for initiatives such as efficient home heating retrofits and school building energy efficiency improvements. It is hard to assess, however, to what extent these are basically energy-efficiency spending schemes or normal capital grants with better energy-efficiency requirements attached.

Overall, UK budget spending on efficiency and renewables is estimated, at a minimum, to be approximately £120m per annum but this figure could be a significant understatement. Funding comes from consolidated revenue as the energy tax receipts are used essentially to lower the cost of employment by cutting social security contributions paid by employers. The figure of £120m is equivalent to about A\$6 per capita per year.

United States

According to its TNC, total federal government direct expenditure on climate change during the years 1999, 2000 and 2001 was US\$1,009 million, US\$1,095 million and US\$1,239 million respectively (United States 2002). This spending was predominantly for:

- research and development on renewables and energy efficiency;
- funding demonstration projects;
- setting voluntary standards; and
- other voluntary activities.

The US Federal Government does not levy any climate-related energy taxes with a result that the funding for expenditure on sustainable energy is sourced from general revenue. Activities are essentially directed towards research and development, the provision of some incentives for sustainable energy and encouragement of voluntary activities.

According to the IEA, about US\$200 million of the above mentioned federal government spending took the form of tax incentives aimed at encouraging the use of energy-efficient and renewable technologies in buildings, vehicles and electricity generation (IEA 2000, pp. 179-192). A significant proportion of the US\$200 million was provided as a tax credit for wind energy investment, worth around 1.5 US cents per kWh generated.

The high level of US government spending on sustainable energy research and development, as shown above, is confirmed by IEA figures on R&D expenditure (IEA 2000). The IEA estimates that US sustainable energy R&D spending in 1999 totalled US\$747 million (IEA 2000, pp. 276, 282).

The picture is different with respect to the states which have introduced a great variety of measures, many of them involving mandatory caps or charges. This general picture of sustainable energy measures in the US is confirmed by the Pew Center's report on 'Climate Change Activities in the US' (Pew Center 2002a).

- Twenty-three states have 'public benefit charges' or 'system benefit charges' on electricity supply and these are used to fund measures promoting renewables and energy efficiency (see Table 4 below). Frequently, these effectively operate as a regulatory requirement for electricity utilities to invest in sustainable energy rather than as a government budgetary program.
- Government authorities administer expenditure on sustainable energy of approximately US\$650 million per year.
- A smaller number of states have state tax credits for energy-efficient appliances but these would have little effect as state taxes are typically at very low rates.

- In addition to expenditure-based initiatives, the extensive range of measures implemented by states include emission caps on power generators.

The outstanding case of state action in the US is California which comprises one eighth of the US population. Driven by the recent electricity power crisis, California enacted the 2001 energy conservation package with US\$800 million for energy conservation initiatives and incentives including:

- US\$105 million renewable generation projects;
- US\$95 million for commercial energy efficiency measures;
- US\$90 million for energy efficient agriculture;
- US\$75 million for rebates to consumers who replace inefficient appliances.

The package also provides funds to building owners and tenants wishing to install demand-responsive power systems and provides low-interest loans for local governments. The initiatives adopted by California appear to dwarf anything attempted by any other state (Pew Center 2002a).

Combining expenditure at both federal and state levels, the above figures indicate that the US spends at least US\$2 billion a year on renewables and energy efficiency. As this calculation does not take into account the one-off additional spending in California, it is likely to be a conservative estimate and is equivalent to A\$12 per capita a year.

Table 4 Summary of programs funded by system/public benefits charges, US States (US\$ million annual)

State	R&D	Energy efficiency	Low income support	Renewable energy	Total	Total utility-administered sustainable energy programs
Arizona	TBD	4	3.9	20	28	24.1
California	62.5	228	100	135	525 +	228
Connecticut	in RE	87	8.7	22	117.7	
Delaware		1.5	0.8	0.3	2.6	
Washington DC		TBD	TBD	TBD	8	
Illinois		3	75	5	83	
Maine		17.2	5.5		22.7	0
Maryland		TBD	34		34 +	
Massachusetts		117	in EE	30	147	117
Michigan		TBD	TBD		50	
Montana		8.9	3.3	1.8	14	10.7
Nevada	TBD	TBD	TBD	TBD	TBD	
New Hampshire		6.9	10.4		17.3	6.9
New Jersey		89.5	10.1	30	129 +	89.5
New Mexico			0.5+	4	5 +	
New York	26	83	27	in R&D	150	
Ohio		15	100		115	
Oregon		31.5	19	9.5	60	
Pennsylvania		11	85	2	98	13
Rhode Island		14	in rates	2.5	16.5	
Texas		80	157		237	80
Vermont		13.1	TBD	TBD	TBD	
Wisconsin	1.1	62	45.3	2.8	111.2	
Total	89.6	872.6	685	264.9	1912.1 +	569.2
Minus low income support					-685+	
Sustainable energy total					1227.1+	
Minus utility administered programs					-569.2+	
Non-utility sustainable energy programs					657.9~	

TBD: to be decided.

Source: ACEEE 2002, Summary Table of Public Benefit Programs and Electric Utility Restructuring, American Council for an Energy Efficient Economy, May, <http://www.aceee.org/briefs/mktabl.htm>

3.3 How Australian spending levels compare

According to Federal Government Budget papers, a total of \$53 million was spent on sustainable energy in 2001-02, and appropriations in the 2002-03 budget totalled about \$87 million (or about 80% of all greenhouse spending) (Kemp 2002). Based on these figures, the federal government spent approximately \$2.50 and \$4 per capita in the two years respectively.

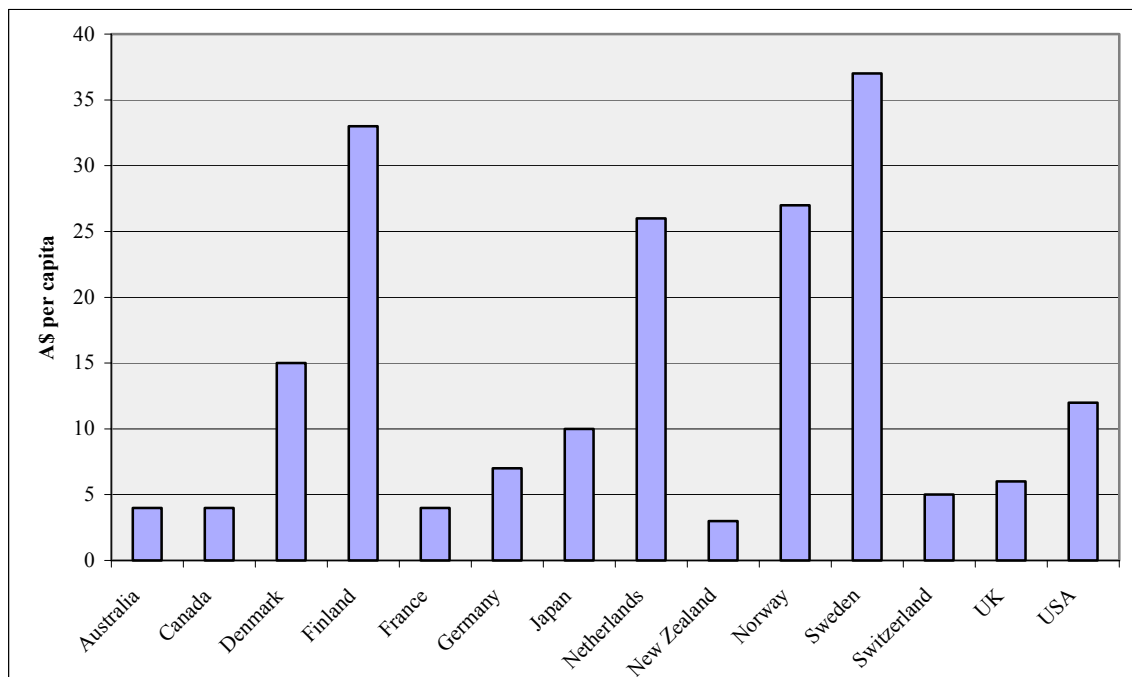
These figures do not include direct funding support by state governments for sustainable energy. Although state governments pursue a wide range of measures on greenhouse under the National Greenhouse Strategy, there is only one significant program that provides direct budgetary support for sustainable energy, the Renewables Investment Program run by the NSW Sustainable Energy Development Authority (SEDA 2002). This program provides about \$5 million a year in loans and grants and adds little, therefore, to the federal funding total.

The figure of \$4 per capita for the current year is compared with the per capita spending of other countries and summarised in Figure 1. As noted above, limitations on the availability and comparability of some international data ensure that such comparisons are best interpreted as illustrative rather than comprehensive.

Based on the estimates in this review Australian spending is:

1. insignificant when compared with the US and Japan;
1. well below European countries such as Finland, Norway, Sweden and the Netherlands;
2. not greatly below a number of other European countries;
3. similar to that of New Zealand; and
4. generally at the low end of spending per capita by developed countries on sustainable energy.

Figure 1 Indicative government expenditure on sustainable energy per capita (A\$)



3.4 Spending levels in developed countries

Sustainable energy expenditure undertaken by governments in a number of developed countries provide some tentative conclusions when compared with that in Australia.

First, given the severe dangers presented by climate change (IPCC 2001), government expenditure throughout developed countries is low. This is the case even in European countries where the most generous funding amounts to only around 0.1 percent of GDP which translates to less than a dollar Australian per head per week. In some countries it is in the order of 0.01 percent of GDP. Clearly there will need to be a much higher level of spending in the longer term

Second, developed countries can be grouped into three categories on the basis of the above indicative figures.

- | | |
|----------------------------------|---|
| Between A\$4 and A\$8/head/year | <ul style="list-style-type: none"> • These countries include several European countries that are larger than Australia but have much lower emission levels per head. • Comparison with these countries suggests that Australia might have to spend significantly more per head because of its higher emissions and to exploit economies of scale. • Australia seems to be at the lower end of this group. |
| The US and Japan | <ul style="list-style-type: none"> • These two countries comprise an intermediate group with respect to spending per head but, according to IEA figures, they dominate research and development spending on sustainable energy. • The amounts contributed by each country to funding in this area are comparable and no other country approaches their levels of expenditure. • The importance these two countries assign to research and development and how it pays off in the longer term demonstrate why these two economies are the largest in the world. |
| Between A\$8 and A\$34/head/year | <p>Several small northern European countries are included in this category. Reasons for their increased spending may be that they:</p> <ul style="list-style-type: none"> • Clearly see the size of the greenhouse challenge; • Understand the advantage of being early movers in technological change and in taking ‘no regrets’ actions; and • Are driven to some extent by their smaller populations and the need to spend a higher figure per head to reach the economies of scale and absolute size of spending necessary to make a difference. |

4. Lessons from international efforts

4.1 Overview of international efforts

This section provides an overview of the positive measures taken by other countries to meet their Kyoto targets. Sources of information for completing this overview included the German Environment Department (German Environment Department 2002) and the TNCs of Austria, Belgium, Denmark, Finland, France, Japan, Netherlands, Norway, Spain, Sweden, Switzerland and the UK.

The objective is to assess what lessons there may be for Australia in how better to focus its greenhouse spending. Most of the countries considered have more demanding targets than Australia.

Australia has little need for positive measures to meet its target. As discussed above, Australia was granted an increase in emissions and has been assisted both by stable agricultural emissions and falls in land clearing emissions. As a result the only positive measures it has been required to take consist of a range of voluntary and information activities, a small element of regulation concerning the form of standards and a low requirement for renewable electricity. As noted above, its spending programs are contributing very little to meeting its target.

All the countries reviewed have, as does Australia, extensive programs relating to information and promotion of climate change as an issue, voluntary measures by all sectors and regulation of standards in areas such as building insulation and energy efficiency of products. Almost all have a mandatory requirement, usually much higher than Australia's, for renewable electricity by 2010.

Several countries such as Denmark, Finland, France, Germany, Netherlands, Norway, Sweden and the UK have carbon or energy taxes sometimes combined with emission trading schemes (Denmark, Norway and the UK).

In many countries including Finland, France, Germany, Japan, Netherlands, Spain, Switzerland and the UK the most important single measure being undertaken is fuel switching in electricity supply. In the main this involves moving from coal to high efficiency gas but in some cases, notably Japan, it involves greater nuclear supply. It is noteworthy that in all cases, the costs of changes to electricity supply such as fuel switching, mandatory renewable components and efficiency standards are not being met from budgets but by the electricity sector itself. That is, except in the case of 'no-regrets' changes, these measures amount to an additional energy tax on the electricity sector and its consumers.

Most countries plan reductions in particular industry sectors through specific measures involving pollution control and voluntary agreements. These measures are more significant in Germany, Japan, Netherlands, Switzerland and the UK. In virtually all developed countries the transport sector is the area responsible for the most serious rise in emissions.

It was noted above that almost all countries outspend Australia in the main greenhouse spending areas of renewable energy and energy conservation. Spending on energy conservation is often a significant contributor to meeting the Kyoto target, principally through the subsidisation of widespread building insulation programs or combined heat and power schemes often involving district heating. Overall, however, no country other than Australia seems to claim spending from the budget as its major tool in emission reductions.

A striking feature of the international comparisons is that the contribution of renewable power to the 2010 Kyoto target is usually very small. Even where it is seen as significant, for example in Denmark, Finland, Germany, Netherlands, Spain and the UK, it is being achieved basically through a mandated requirement from suppliers. What this means is that the significant public sector spending by many countries on renewable energy is not aimed at 2008-12 but well beyond that.

The longer-term importance of renewable energy is demonstrated in projections by some countries showing relative change in emission reductions to 2008-12 or beyond (Germany, Netherlands, UK) thus indicating a growing reliance on renewables over time. This is not unexpected given the need for heavier emission reductions in future years and the unavailability in the future of one-off current measures such as fuel switching from coal to gas, insulation of existing buildings and improved pollution control in industry.

In developed countries, a typical scenario is therefore of groundwork being laid now by means of an initial mandated renewables component in electricity and early spending to promote renewables. Over the years ahead, expansion in the use of renewables will then be driven by the carbon tax and/or emissions trading that many countries have now adopted. High energy-efficiency standards and pollution controls will be improved. The looming problem of increased transport industry emissions might potentially be solved by fuel cell vehicles.

4.2 Conclusions for Australia for beyond 2012

The key question is how can Australia's greenhouse spending best prepare it for more demanding targets beyond 2012? That more demanding targets are likely cannot be doubted. Unless the weight of evidence supporting the existence and implications of the human-induced greenhouse effect changes radically, there is no doubt the world will be looking for much tougher greenhouse targets after 2012.

The only significant obstacle to concerted global action at the moment is the Bush administration in the US. What is not generally realized, however, is how extreme that administration's stance is on greenhouse within the US context. The spending figures above show that the US is well prepared in research, demonstration and early commercialisation of renewables and energy conservation. Many of its States are very active on greenhouse measures as the spending figures show. Furthermore, public opinion in relation to concern on greenhouse is not markedly different from that in other developed countries and Congress has before it, as a consequence, a large number of proposals evidencing a far more concerned attitude than that displayed by the White

House (Pew Center 2002b). Consequently, even if the US never ratifies the Kyoto Protocol, it is actually well placed to undergo an abrupt change in attitude with respect to the period after 2012 by directing a major effort towards climate change, just as the US has done in the past on similar global questions.

The Howard Government says that it is not ratifying the Kyoto Protocol because it wants to protect jobs and investment in Australia (Kemp 2002b). It has also indicated that it wants to see developing countries as part of any agreement on limiting emissions. The strategy appears to be that Australia should continue to use its competitive advantage in terms of cheap fossil fuels, unhampered by the 'unfair advantage' that developing countries enjoy from not having to observe emission limits. This approach raises several difficulties.

First, it is questionable as to whether Australia's long term economic interests are best served through an ongoing reliance on fossil fuel exports. By focusing attention on the potential costs to this sector, the Government is ignoring the potential benefits associated with energy efficiency and being an early adopter of renewable technologies.

Secondly, refusing to ratify Kyoto diminishes Australia's influence with respect to the form of post-Kyoto targets. Under the Kyoto Protocol, negotiations on the second commitment period begin in 2005. Over time Australia will find it more and more difficult to operate outside the Kyoto framework.

Thirdly, the inclusion of developing countries among those accepting limits on emissions, as sought by the Government, would clearly increase the say these countries have in post-2012 targets. These countries generally favour the idea of equal emission rights per person across the globe, or the widely supported concept of 'contraction and convergence' among countries as a way of moving towards equal global rights. (See Hamilton (2001) for a discussion of these issues). This general stance suggests heavy demands would be placed on Australia with its record emissions per person.

Fourthly, the only broad approach that Australia could advocate to achieve a 'fair' global system, one that does not impose arbitrary emission reductions on countries, is the general idea of a global carbon tax level or a global emissions trading system. These initiatives would place Australia on the same footing as any other country in bidding for emitting industries - the 'unfair advantage' of developing countries would disappear.

While this would accomplish what appear to be the goals of the Howard Government, it would, in fact, impose great demands on Australia. The price of emissions would have to be high to make an impact. While Australia would be placed on an equal footing where new emitting industries are concerned, existing emitting industries and economies with high emissions overall would be jeopardised. Industry would alter - for instance new aluminium smelters would use hydro power, not coal-fired power. Because emissions arise from so many activities in Australia, there would be adjustment costs across the economy.

The only realistic long-term approach is therefore to prepare for significant emissions

reductions beyond 2012. Australia would be better prepared for this eventuality were funding to be directed away from its current ineffective and inefficient concentration on abatement for the 2008-12 target and towards long term preparation for either a heavy arbitrary reduction figure placed on Australia or a significant global carbon emissions price through a carbon tax or emissions.

Preparation for the years after 2012 should mean current spending with a focus on:

- renewable energy research, development, commercialisation and deployment for long term effect, without the distraction of current abatement effects; and
- abatement and energy efficiency demonstration models, as discussed above in relation to a changed GGAP. As well as preparing Australia for the future, these would give a good idea of the costs of alternative abatement approaches, and generally provide a practical picture of the real costs of meeting the greenhouse task, especially ‘no-regrets’ and low-cost opportunities.

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