Submission to the Senate Select Committee on Climate Policy

Dr Peter Wood[1], April 2009

These submission is on the Australian Government's Exposure Draft Legislation for the implementation the Carbon Pollution Reduction Scheme (CPRS), and Australia's climate policy in general.

This submission is primarily concerned with two issues. Firstly we shall look at the issue of achieving international cooperation to reduce greenhouse gas emissions. We shall examine how this relates to the targets in the CPRS, and the approach for choosing targets, based on "scheme caps and gateways". This relates to items (1) (c) and (1) (d) of the terms of reference.

Secondly we examine the issue of what is the best instrument for a carbon price signal. We conclude that an emission trading scheme with a "price floor" is the most appropriate policy for Australia. This relates to items (1) (a) and (1) (d) of the terms of reference.

Summary of Recommendations

We have two key recommendations.

1. To not set a lower bound for Australia's emissions after 2015. We therefore recommend the removal of paragraphs 2(b) and 3(b) from Section 15 of the Exposure Draft Legislation.

2. To introduce a floor in the carbon price. The price floor could be implemented by either altering Section 129 of the Exposure Draft Legislation, or by altering Section 103 of the Exposure Draft Legislation.

1 Dr P. J. Wood, The Department of Applied Mathematics, Research School of Physics and Engineering, The Australian National University (Peter.J.Wood@anu.edu.au).

1. The Carbon Pollution Reduction Scheme and International Cooperation

The most crucial problem, when it comes to mitigating climate change, is the problem of achieving international cooperation to reduce greenhouse gas emissions. We shall examine the issue of what changes should to be made to the legislation to maximise the likelihood of international cooperation to reduce greenhouse gas emissions.

The 15% Conditional Target

The Carbon Pollution Reduction Scheme is likely to rule out net emissions reductions of more than 15% of 2000 levels by 2020 (Part 1, Section 3 (4) of the Exposure Draft Legislation). I will argue that this reduces the likelihood of any international agreement that stabilises greenhouse gas levels at 550 parts per million or less, because it rules out Australia playing its proportionate part in emissions reductions.

It has been suggested in the Treasury modeling that the 15% target is consistent with global stabilisation of greenhouse gases at 510 ppm CO_2-e (carbon dioxide equivalent)[2], but this is unlikely to be true. This modeling claims that the CPRS -5 and CPRS -15 "multi-stage" scenarios are more realistic than the Garnaut "contraction and convergence" scenarios because the multi-stage scenarios assume that different countries start taking on emissions reductions at different times[3]. But there is another difference, the CPRS scenarios assume that when a group of countries start making emission reductions, they all do so at the same rate relative to the reference scenario. Because emission reductions do not relate to per-capita emissions, this is unlikely to be perceived as equitable by developing countries and low per-capita emitters, and therefore unlikely to be an approach that would be accepted by developing countries.

The Garnaut scenarios are based on all countries eventually converging to the same per-capita emissions allocations in 2050. After 2050 different countries may have different gross amounts of per-capita emissions, but they are allocated the same number of permits per person. Is a convergence date of 2050 likely to be acceptable as part of an international agreement? In his *Targets and Trajectories* Supplementary Draft Report, Garnaut stated[4]:

> A relatively gradual convergence to equal per capita allocations, with the year 2050 proposed

2 A greenhouse gas atmospheric target, when measured in carbon dioxide equivalent, measures the climate impact of all greenhouse gases in equivalent units of carbon dioxide. We will also be discussing carbon dioxide levels (as well as greenhouse gas levels). A carbon dioxide level is a lower bound to the greenhouse gas level.

3 Treasury (2008), p. xi.

4 Garnaut (September 2008), p. 14.

> by the Review, could be seen in developing countries as developed-country-biased, as it perpetuates for some time the current unequal patterns of use of the atmosphere. What is outlined is probably at the limits of acceptability to developing countries—it demands a modest departure from developing countries' current emissions growth path in the short term, and strong deviations in the medium term.

It is important for Australia to be flexible on issues that relate to equity, including whether an agreement is based on per-capita emissions, and the convergence date for an agreement based on per-capita emissions. This is because it is more likely that a large number of countries will agree to an international environmental agreement if it is perceived to be equitable.[5] For Australia, a developed country and a high per-capita emitter, to not be flexible on equity issues that favour high per-capita emitters, would undermine the likelihood of a comprehensive international agreement that reduces greenhouse gas emissions.

There is also the possibility that an international agreement is reached that is not consistent with Australia's proposed targets. Australia would then have two choices: It could accept the agreement and change its targets; it could not accept the agreement and face the consequences of being perceived to be a free-rider. The CPRS White Paper argues for scheme caps and gateways because they provide certainty to investors[6], but they provide less certainty if there is a risk that Australia will have to change its targets in order for it to participate in an international climate agreement.

Because Australia should be flexible on the issue of contraction and convergence, and the convergence date, it would be useful for international scenarios with an earlier convergence date to be considered. This could include a 2040 convergence date and a 2030 convergence date. Ball-park estimates[7] suggest that a convergence date 10 years earlier (i.e. 2040 instead of 2050 or 2030 instead of 2040) would require Australia to have its 2020 emission allocation reduced by 8-16%.

Scheme Caps and Gateways

We now turn our attention to the issue of scheme caps (Part 1, Section 3 (4) of the Exposure Draft Legislation) and gateways (Part 2, Section 15 of the Exposure Draft Legislation). The legislation states that the regulations must set a scheme cap for five years *or more* into the future; and may set a scheme gateway, with upper bounds and lower bounds for the scheme cap for the financial year beginning on July 2015, and *any* later financial year. This is slightly different to what is stated in the White Paper,

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5 See Barrett (2003), pp. 299-301, for a game theoretic discussion on why fairness would be perceived to be important by participants in a cooperative outcome.

6 Department of Climate Change (December 2008), Chapter 10.

7 Wood (September 2008), Page 8.

which is that "the Government intends to provide up to 10 years of gateways beyond the minimum five years of certain Scheme caps, taking into account progress in international negotiations" (Policy decision 10.3).

There are two issues here. Firstly, are the caps and gateways that are in the government policy (the White Paper) appropriate? Secondly, is the framework for caps and gateways (the Exposure Draft Legislation) appropriate? Let us focus on the second issue.

Suppose for a moment that there was a comprehensive international agreement that not only reduced greenhouse gas emissions, but also reduced emissions in an optimal way. In other words, taking into account the climate science, as well as the costs of mitigation and damages from climate change. The economics of climate change suggests that we should do our best to avoid even a low probability of potentially catastrophic outcomes[8]. The science, according to the NASA climate change scientist Dr James Hansen, suggests that if we maintain carbon dioxide concentrations of 450 ppm or more, for sufficiently long, the Earth would be pushed toward an "ice-free state", and "the passing of climate tipping points and dynamic responses that could be out of humanity's control". Hansen therefore recommends that "an initial CO_2 target of 350 ppm, to be reassessed as effects on ice sheet mass balance are observed, is suggested"[9].

What sort of emission reductions are required to stabilise CO_2 levels at 350 ppm or less? For any particular target, there is more than one trajectory to that target, and more than one way of allocating emissions between countries for any particular global trajectory. Most studies that have been done so far have focused on higher stabilisation targets, but there have been some that have included trajectories that stabilise at 350 ppm CO_2. One of the more recent studies has OECD countries reducing their emissions by 5.17% per year[10]. No one has modeled in any detail (as far as the author is aware) what the mitigation costs of stabilisation at 350 ppm or less of CO_2 are. However, there have been studies that suggest that the cost of stabilising at 450-500 ppm CO_2-e of greenhouse gases are low.[11]

If optimal international cooperation on reducing greenhouse gas emissions was achieved, Australia could have reductions in emissions allocations of over 5% per year. This may be expensive, but an approach that is optimal globally is likely to have net benefit for Australia, more so than for most other countries. It would not in in Australia's interest to rule out such a possibility.[12]

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8 Weitzman (2009).

9 Hansen (2008).

10 Meinshausen (2006), p. 166.

11 McKinsey Global Institute (June 2008)

12 There are huge barriers to this level of international cooperation, but it is not unheard of. The Montreal Protocol on Substances That Deplete the Ozone Layer achieved a level of cooperation that was not far from optimal, this is

It is therefore recommended that given:

- what the science is saying about the climate situation,
- Australia's high per-capita emissions,
- Australia's high historical emissions,
- and Australia's high capacity to reduce emissions or pay for emissions reductions because of its high per-capita GDP,

it is not appropriate to rule out any level of emissions reductions beyond 2015, and certainly not for an unlimited amount of years into the future. It is appropriate to have an upper bounds on Australia's emissions for years beyond 2015, but not a lower bound. Part 2, Section 15 of the Exposure Draft Legislation should therefore be changed to reflect this issue. This could be easily achieved by removing paragraphs 2(b) and 3(b) from Section 15 of the legislation.

There are also problems with setting weak targets five years in advance: The targets for 2010-2013 are extremely weak, with the 2010-2011 target probably being greater than the amount of emissions.[13] When combined with the 5-15% target range, there will probably be a very low carbon price. The only thing that is likely to prevent the price from collapsing is the banking of permits. It could also be argued that flexibility in emissions reductions could facilitate unforeseen international circumstances, either in the science, or in negotiations. It is therefore recommended that Section 14 of the legislation is changed so that instead of an exact cap being set for five years, a gateway of upper and lower bounds is set for five years.

It could be argued that measures that reduce the certainty of the scheme cap provide uncertainty for investors. This is true in a limited sense, but there is also severe risk and downside uncertainty on impacts from climate change; in other words there are uncertainties in the climate change damage function. There is uncertainty in international negotiations. There are uncertainties in what carbon price will be required to achieve a certain level of emission reductions, and uncertainties in the costs of emission reductions. These uncertainties will not be dealt with by locking in a particular target range. Some of these uncertainties, such as in international negotiations and climate change impacts, could be made worse by policy measures such as these if they involve inadequate targets.

Measures that shift risk and uncertainty from investors to the climate are not appropriate any more, and

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discussed in Barrett (2003), Chapter 8.

13 The targets for 2010-2013 are in Policy Position 4.5 of the White Paper – Department of Climate Change (December 2008). See Department of Climate Change (February 2008) for information on Australia's projected emissions.

also are not credible. This is particularly the case when it comes to measures that are not consistent with international cooperation on reducing emissions. This is because a world with poor cooperation on climate change policy is a far more uncertain world than a world where good cooperation is achieved.

2. Why the CPRS Should Have a Price Floor

The CPRS is a policy that seeks to reduce greenhouse gas emissions by introducing a price on carbon. Possible policies for carbon pricing include cap and trade schemes, carbon taxes, and hybrid approaches. Cap and trade schemes involve setting the quantity of emissions, with this quantity and the market determining the carbon price; carbon taxes involve setting the carbon price directly, with the market determining the amount of emissions. Hybrid approaches can usually be thought of as cap and trade schemes but where there is either a minimum price – a price floor, a maximum price – a price ceiling, or both.

The CPRS is a cap and trade scheme, but there is a transitional ceiling on the carbon price (Section 89 of the Exposure Draft Legislation). This ceiling will be phased out by 2015. While this ceiling exists, the emissions cap can always be exceeded by firms buying permits that are at the value of the price ceiling. To this extent the CPRS has similarities to a carbon tax.

One of the main arguments in favour of cap-and-trade is that international negotiations are based on a "target-and-timetables" approach. Emissions trading (on a national scale) has the advantage that there is much more certainty that a given target will be reached. This increases the credibility of targets under international negotiations, more so than a carbon tax.

There are other advantages to a carbon tax. If the cost of mitigation is lower than expected, then there will be more mitigation with a carbon tax. There will be no limit to the amount of low cost mitigation that occurs. Under a carbon tax, voluntary measures that reduce emissions will add to Australia's total emissions reductions.

A emissions trading scheme with a price floor has many of the advantages of a carbon tax and many of the advantages of a cap and trade scheme.

There are two ways that the CPRS legislation could be modified so that a price floor is introduced:

1. The price floor can be maintained by having firms pay an extra fee when they surrender their permits, based on the amount of their emissions. The carbon price then becomes equal to the sum of the permit price and the extra fee. This could be achieved by altering Section 129 of the Exposure Draft Legislation.

2. The price floor could be maintained by having a reserve price when permits are auctioned. This could be achieved by altering Section 103 of the Exposure Draft Legislation.

The approaches to introducing a price floor above are different to what was discussed in the Garnaut Review[14]. The Garnaut Review considered and rejected a mechanism for introducing a price floor by

14 Garnaut (2008), p. 310.

having the government buy back permits. The Garnaut Review did not consider the approaches examined above.

If a price floor was introduced, changes may also be needed to be made to the legislation with regard to international trading of permits.

If a price floor was introduced, what price should it be set at? There are two possible approaches to this:

1. One approach would be to set it so that it is relatively low, but is high enough to mean that the amount of low cost emissions reductions is not limited, and high enough to provide some certainty to investors in low emission technologies. Under this approach, the emissions cap would be expected to be the main policy that drives emissions reductions.

2. Another approach would be to have a significantly higher price floor, that is close to the social cost of carbon. Under this approach, the price floor is likely to be what drives emissions reductions. Under this approach the main role of the emissions cap is to provide certainty that a given target will be achieved, and add credibility to international negotiations.

If the role of the floor price was merely to provide insurance against the carbon price being exceptionally low (as was the case in the EU ETS during 2006 and 2007), it would not be necessary - there are better mechanisms from preventing this, such as banking, and making sure that there is scarcity when setting the cap. The idea of setting the floor price to be equal to the social cost of carbon is that the floor price has just as important a role as the permit price in driving emission reductions. There is a good chance that the slope of the marginal cost function of mitigation is higher than the slope of the marginal benefit function over short time scales, which suggests that the floor price will be a better driver of emission reductions.

Another issue with carbon pricing is how much should the price floor increase each year? An appropriate choice may be to have the price indexed by a discount rate of 4%, which is the discount rate used in Treasury modeling.

Instrument Choice and Uncertainty

The prices vs. quantities question is addressed in Weitzman's 1974 paper, *Prices vs. Quantities*. Climate change is more complex than the situation discussed in Weitzman (1974), because of Weitzman's more recent (February 2009) work. The model in Weitzman (1974) assumes that the costs and benefits of climate change mitigation have uncertainties that are sufficiently small that the cost and benefit functions can be approximated using a second order approximation, and does not take into account risk aversion. Weitzman (2009) shows that with risk aversion, the cost function of climate

change (which is the benefit function of mitigation) has a "long fat tail" and what he calls "potentially unlimited downside exposure". This implies that the tail of the probability distribution dominates the cost of climate change, and that the expected cost is infinite unless one introduces a parameter based on how much we are willing to pay to preserve "life or civilization as we know it".

Weitzman's approach to prices and quantities is about uncertainty: when there is no uncertainty, they are equivalent, so the choice of instrument depends is based on minimising the expected cost of getting the price or quantity wrong. The standard interpretation of Weitzman's model is that when the slope of the mitigation cost function is greater than the slope of the mitigation benefit function, price mechanisms (taxes) are better; when the slope of the mitigation cost function is less than the slope of the mitigation benefit function, quantity mechanisms (cap and trade) are better.

One issue that affects instrument choice is that the slope of the cost and benefit functions are also uncertain. When there is uncertainty in the slopes, there are more advantages to a quantity based approach (see p. 486 of Weitzman (1974)).

Not only does Weitzman's recent work mean that the expected cost of climate change is higher than previously thought, it also describes how obtaining more information about climate change updates the probability distribution of climate change costs in a Bayesian manner - a 'prior' distribution is replaced with a 'posterior' distribution. If the IPCC Fourth Assessment Report estimates of climate change costs are thought of as a 'prior' distribution, inclusion of the latest science can be thought of as a 'posterior' distribution. Recent scientific evidence suggests that the posterior distribution may be somewhere in the 'bad tail' of higher costs[15].

While the benefits of mitigation have a long tail, the costs of mitigation can be bounded above. For example, we can choose an expensive technology such as solar power as an upper bound for the cost of mitigation (provided the time period is long enough to manufacture the solar panels) in the electricity generation sector. When introducing a carbon price in one country, the costs in one particular year can also be bounded by purchasing international permits or by banking and borrowing.

This all suggests that the risk of the cost of climate change exceeding the amount invested in mitigation is far greater than the risk of the cost of mitigation exceeding the cost of climate change. Both the likelihood of climate change costing more and the expected cost of climate change costing more are higher. This risk can be reduced by having a cap-and-trade approach which also has a price floor, as described above. Because of the long tail, if there was a price cap, there would also be a risk that the cost of climate change would exceed the price cap. Having a price cap is therefore not recommended. A case could be made for countries with low per-capita emissions and per-capita incomes, such as India, to have a price cap, however.

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15 See for example, Hansen (2008).

Instrument Choice and International Cooperation

We shall now discuss instrument choice and the problem of achieving international cooperation. One of the main arguments in favour of cap-and-trade is that international negotiations are based on a “target-and-timetables” approach. Emissions trading (on a national scale) has the advantage that there is much more certainty that a given target will be reached. This increases the credibility of targets under international negotiations, more so than a carbon tax.

A difficulty with individual countries being allocated targets is that it can be difficult to arrive at an agreement that "adds up" to a given level of emissions reductions. Individual countries will try to argue why they should have special treatment, making an international agreement more difficult. If an international agreement does not succeed, then alternative approaches for cooperation to reduce global emissions will be needed. One alternative approach would be for countries to agree to introduce a carbon tax. If Australia was to introduce a price floor, it could facilitate alternative approaches to emissions reductions, at the same time as facilitating a targets and timetables approach.

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