



**ITS Global**

Consultants on Global Issues

---

## **Low Carbon Growth Plan for Australia**

**A critique of the Report by  
ClimateWorks Australia**

**ITS Global**

**June 2010**

---

LEVEL 26, 35 COLLINS STREET  
MELBOURNE VIC 3000 AUSTRALIA  
T: +61 3 9654 8323  
F: +61 3 9654 4922  
[WWW.ITSGLOBAL.NET](http://WWW.ITSGLOBAL.NET)

## Executive Summary

In March 2010 ClimateWorks Australia published a plan to cut greenhouse gas emissions from all sectors of the Australian economy.<sup>1</sup> Its plan was based on its estimation of an abatement cost curve for Australia, using an approach developed by McKinsey & Company.

ClimateWorks estimated that the cost to society of its proposed emission cuts would be \$1.8 billion per year — equivalent to 0.1 per cent of projected GDP in 2020. It expected that about 22 per cent of its proposed cuts would generate a net benefit. In the absence of the benefits, however, the cost to society would be \$7.3 billion per year. Finally ClimateWorks estimated that the carbon price that was required would be around \$100 per tonne of CO<sub>2</sub>-e.

The ClimateWorks plan suffers from three substantial flaws.

The plan overstates the extent of the emissions savings that would be achieved by the Australian economy. The plan double counts the abatement gains that are in the baseline projection of greenhouse gas emissions that were used to estimate the abatement cost curve. The abatement cost curve attributes part or all of the emission savings that would be achieved in the normal course of business to prospective emission savings.

The ClimateWorks plan only captures the ‘techno-engineering costs’ associated with abatement. In doing so it understates or omits some of the direct costs of the options:

- the additional transmission and distribution costs in the National Electricity Market from the proposed switch to renewable energy sources;
- the costs of additional reserve capacity in the National Electricity Market (NEM) from the proposed switch to renewable energy resources in electricity generation;
- the loss of output and option values from the constraints on land-use in the forestry and agricultural sectors that are fundamental to the abatement options in those sectors;
- the cost in public administration to design, implement and manage the policy measures that will be necessary to realise the emission savings; and
- the compliance costs that would be imposed on the private sector by the implementation of these policy measures.

The ClimateWorks plan is based on an analytical shortcut. This shortcut focuses on the relationship between two strongly-rated economic variables — the volume of emission savings and the direct cost of those savings — while trying to hold everything else constant. The approach can provide a good approximation of the relationship between the volume of emission savings and the direct cost provided none of the other variables change. The scale of the aggregate emission savings in the ClimateWorks plan, however, means that many of the other variables in question may be expected to change as well. The plan has ignored such economy-wide impacts that the abatement options would generate.

---

<sup>1</sup> ClimateWorks Australia, 2010, Low Carbon Growth Plan for Australia, March

An idea of the importance of the omissions may be gained from an economy-wide modeling analysis of the US abatement cost curve estimated by McKinsey. This indicated that the abatement cost for the US was more than a magnitude greater than the one ClimateWorks has estimated for Australia using the same approach. Australia's greater reliance on fossil fuels means that the ClimateWorks estimate is simply not plausible

The main economic impacts that have been ignored by ClimateWorks are:

- increases in gas prices from fuel substitution;
- increases in electricity prices & their downstream impacts;
- enhanced risk & uncertainty associated with emissions policy regime at national and international level.

ClimateWorks has proposed a switch from coal to natural gas. This would increase the price of gas compared to what ClimateWorks has assumed. The increase would adversely affect all gas users but the most severe impacts would be felt by the trade-exposed industries, which would suffer a loss of international competitiveness.

The switch from coal to gas would also increase electricity. Modeling by the Commonwealth Treasury indicates that an emissions cut of 5 per cent against the 2000 level would increase electricity prices by an average of 86 per cent above the level without the cut.

Any increase in electricity prices would adversely affect all electricity users — with the trade-exposed industries suffering further losses of competitiveness. They include: iron and steel; non-ferrous metals; electronics; glass products; cement; and pulp and paper.

Uncertainty actively discourages investment in the new products, business processes, and development of new markets that are the keys to productivity growth and enhanced living standards. While there are strategies to reduce or ameliorate uncertainty, they involve costs. ClimateWorks has ignored such costs, because they were difficult to quantify.

The unresolved debate over the policy response to greenhouse gas emissions, at both the national and international level, has greatly increased the uncertainty faced by Australian business. The hiatus is likely to continue for the foreseeable future and, in the meantime, will have an adverse impact on business investment and innovation, especially in the more emissions intensive industrial sectors. This in turn will mean that GDP and living standards in Australia will be lower than otherwise would be the case.

None of the uncertainties have been incorporated into the abatement cost curve estimated by ClimateWorks or canvassed in its report. This is most surprising given that ClimateWorks estimates the electricity sector should invest more than \$44 billion in new generation capacity, over and above that required to sustain 'business as usual' in the sector.

The ClimateWorks report makes no attempt to grapple with how its estimates might vary with changes in their underlying assumptions. In particular, it completely ignores how sensitive the abatement cost in Australia is to the nature and extent of any abatement measures that might be implemented in parallel by each of its major trading partners.

## Preface

ClimateWorks Australia is a partnership set up by The Myer Foundation and Monash University to address the issue of greenhouse gas emissions from Australia. It is part of the international network that has been established by the ClimateWorks Foundation.

In March 2010 ClimateWorks has published a plan for cutting greenhouse gas emissions from the Australian economy. For this it has received financial assistance from the Australian Carbon Trust, staff resources from the Australian and Victorian Governments, and analytical support from McKinsey & Company.

The ClimateWorks plan was based on its estimates of the cost of abatement and quantity of emission savings, which it considered were achievable for a range of abatement options.

The approach used to estimate the Australian abatement cost curve was originally developed for the US by McKinsey & Company in collaboration with several businesses and environmental organizations.<sup>2</sup> McKinsey affiliates subsequently extended the approach to the UK, Germany, Japan, Indonesia, and Australia.<sup>3</sup> ClimateWorks has revised the McKinsey estimates for Australia in collaboration with the firm.

The abatement cost curve estimated by ClimateWorks suffers from three substantial flaws.

- It overstates the extent of the emissions savings that can be achieved from the emission reduction options.
- It understates the total costs of the abatement options to the Australian economy.
- It ignores the economy-wide impacts of the emission reduction options.

The seriousness of these flaws has meant that the McKinsey approach has been extensively criticised. For example, CRA International, a global economic consultancy based in the US, has published detailed criticisms of both the US and Australian abatement cost curves estimated by McKinsey.<sup>4</sup>

The rest of this report examines the flaws of the approach used by ClimateWorks in greater depth.

---

<sup>2</sup> McKinsey & Company, 2007, *Reducing U.S. Greenhouse Gas Emissions: How Much at What Cost*, Greenhouse Gas Abatement Mapping Initiative, Executive Report, McKinsey & Company and the Conference Board, December. The collaborating organizations were: DTE Energy; Environmental Defense; Honeywell; National Grid; the Natural Resources Defense Council; Pacific Gas & Electric Company (PG&E); and Shell

<sup>3</sup> McKinsey & Company Australia, 2008, *An Australian Cost Curve for Greenhouse Gas Reduction*, Sydney, February

<sup>4</sup> The critique of the US cost curve is in Howard W Pifer III, W David Montgomery, Dean C Maschoff, and Anne E Smith, 2008, *Managing the Risk of Greenhouse Gas Policies*, CRA International Inc, January. The critique of the Australian cost curve is in Mike Thomas and Stuart James, 2008, *Need a Strategy (or Policy) to Respond to the Risk of Climate Change?: Don't Rely on a Simple Supply Curve Approach*, CRA International Inc, June.

## 1. The Low Carbon Growth Plan for Australia

In March 2010 ClimateWorks has published a plan to cut the greenhouse gas emissions from the Australian economy. The plan is a 'portfolio of prompt action' to:

- remove barriers to abatement option with a positive return to business;
- introduce a price for the carbon in greenhouse gas emissions;
- remove barriers to options for which technology and economics are well understood but are not currently profitable to undertake for business; and
- undertake longer term actions to improve the economics and certainty of options with high abatement potential that are currently difficult to implement.<sup>5</sup>

From its analysis of the cost of the abatement options facing the Australian economy, ClimateWorks concluded that

- By 2020 Australia could reduce its greenhouse gas emissions to 25 per cent below their 2000 level, measured in terms of their carbon dioxide equivalents (CO<sub>2</sub>-e). None of the proposed emission cuts would involve changes in either lifestyles or the mix of businesses in the economy.
- The cost to society of the emission savings was estimated to be \$1.8 billion per year, equivalent to 0.1 per cent of projected GDP for 2020.
- About 22 per cent of the proposed emission cuts would involve a 'negative cost' for the Australian economy. In other words, they could be expected to generate a net benefit. In the absence of these benefits, the cost to society was estimated at \$7.3 billion per year.
- By 2020 the cost of the marginal cut in greenhouse gas emissions — i.e. the most costly of the options identified — is expected to have risen to around \$100 per tonne of CO<sub>2</sub>-e.<sup>6</sup>

The centre piece of the ClimateWorks analysis involved the estimation of abatement cost curves for the Australian economy for the years 2020 and 2030, using the approach previously developed by McKinsey & Company and its Australian affiliate.

The estimation involved the following steps:

- Definition of a 'business as usual' (BAU) forecast for greenhouse gas emissions by the Australian economy based on no changes in public policy. This was based on the 2009 emission projections by the Department of Climate Change.<sup>7</sup>

---

<sup>5</sup> ClimateWorks 2010, p. 3

<sup>6</sup> ClimateWorks 2010, p 2, 13 & 14

<sup>7</sup> Department of Climate Change, 2009, *Tracking to Kyoto and 2020 – Australia's Greenhouse Emissions Trends 1990 to 2008–2012 and 2020*, Canberra

- Identification of the emission abatement options facing Australia. Among other data sources, this drew on the results of management consultancy assignments on emission abatement for McKinsey clients around the world.
- Estimation of the emission savings associated with each abatement option against the BAU forecast for 2020.
- Estimation of the capital and operating costs and costs, in 2010 prices, of each abatement option over its life span. Projections of the changes in real fuel costs over the evaluation period were sourced from consultancy reports prepared for the Commonwealth Government.<sup>8</sup>
- Ranking of the abatement options from lowest to highest in terms of total cost per tonne of CO<sub>2</sub>-e saved in 2020. Each set of rankings gave a cost curve, which can be interpreted as the supply curve for emission cuts in the year in question.
- Use of the abatement cost curve to indicate the marginal cost of any desired saving in BAU emissions.

Many of the data and other assumptions used by ClimateWorks to estimate the abatement cost curve for Australia have not been detailed in its report. Accordingly from the information in the report it is not possible to reproduce the estimates of the emission savings and cost for the individual abatement options that make up the estimated cost curve. For example, the reader does not know how much electricity is expected to be generated by the renewable energy options proposed by the report, nor how much land would be affected the option to reduce land clearing and what that land had previously been used for after it was cleared.

---

<sup>8</sup> ACIL Tasman, 2009, *Fuel resource, new entry and generation costs in the NEM*, Report prepared for the Inter-Regional Planning Committee [of the Australian Energy Markets Commission], ACIL Tasman Pty Ltd, Melbourne, April, and ACIL Tasman, 2008, *Projected energy prices in selected world regions: The estimation of energy prices for existing and new technologies in a number of regions around [sic]*, Report prepared for the Department of the Treasury, ACIL Tasman Pty Ltd, Melbourne, May

## 2. Abatement Cost Curve Overstates Emissions Savings

The report by ClimateWorks overstates the extent of the emissions savings that could be achieved in the Australian economy.

ClimateWorks has double counted abatement gains in its baseline projection of greenhouse gas emissions. In effect it has attributed to the abatement options that it has identified, a part or all of the emission savings that are expected to be realised in the normal course of business, with no intervention by either the Commonwealth or the States.

In an advanced economy such as Australia, the competitive process means that businesses have a strong incentive to innovate by developing new technologies, adopting technologies as they become available, and adapt existing technologies to new purposes. Business innovation is the key to productivity growth, as well as to its major consequence — rising living standards. A business that does not bother to innovate runs the very real risk of being displaced in the marketplace by those that do. In the absence of legal barriers to entry, even apparent monopolists are exposed to the possibility of entry by more innovative rivals.

While public policy can influence the rate of business innovation, within rather wide limits, most of its influence is indirect not direct. For example, in recent decades the Australian economy experienced a pronounced acceleration in its productivity growth. This was a consequence of a series of microeconomic policy reforms in the 1980s that opened sectors of the Australian economy, which had previously been largely, if not completely, insulated from domestic and international competition.

For these reasons, any BAU projection of greenhouse gas emissions from economic activity or of economic activity will include, implicitly if not explicitly, the impact of businesses progressively adopting new technologies and adapting existing ones. If public policy does not change — the key assumption of any BAU scenario — the trend rate of productivity growth can be expected to continue unchanged. Among others, the impacts of this trend will include the following:

- progressive increases in energy efficiency per unit of output; and
- progressive declines in the volume of greenhouse gases emitted per unit of output — if only by virtue of the improvements in energy efficiency.

Over a long period of time — such as the one used by ClimateWorks in its analysis — the cumulative impacts of technological change on energy efficiency and on the intensity of greenhouse gas emissions are likely to be substantial.

Historically the Australian economy has realised an annual improvement in energy efficiency of about 0.5 per cent a year on average in all sectors except electricity and transport.<sup>9</sup> As a consequence the Commonwealth Treasury assumed a continuation of the

---

<sup>9</sup> Leanna Tedesco and Sally Thorpe, 2003, *Trends in Australian Energy Intensity: 1973-74 to 2000-01*, Report for the Ministerial Council on Energy, Report No 03.9, ABARE [Australian Bureau of Agricultural and Resource Economics], Canberra; IEA [International Energy Agency], 2004. *30 Years of Energy Use in IEA Economies — Oil Crisis and Climate Challenges*, OECD/IEA, Paris; Clara Cuevas-Cubria and Damien Riwoe, 2006. *Australian Energy: National and State Projections to 2029-30*,

historical rate of improvement in energy efficiency in estimating its 'business-as-usual' reference case for its CGE analysis of the Government's proposed Carbon Pollution Reduction Scheme (CPRS).<sup>10</sup>

The Productivity Commission has analyzed the trends in greenhouse gas emission intensity in Australia — in terms of the CO<sub>2</sub> emissions per unit of output — between 1973-74 and 2000-01.<sup>11</sup> In the absence of any growth in output over this period, they estimated that emissions would have fallen by 17 per cent. All of the sectors which rely on primary energy inputs, registered significant reductions in emission intensity, except for mining and the energy conversion sector. The Productivity Commission estimated more substantial falls in emission intensity in a number of economic sectors over the period in question:

- manufacturing (-60 per cent);
- commercial (-46 per cent);
- households (-42 per cent); and
- transport (-24 per cent).

The more recent estimates of the subsequent trends in energy intensity suggest that the emission intensity in the Australian economy has continued to decline since 2000-01.<sup>12</sup>

The Department of Climate Change assumed continual gains in energy efficiency for the BAU forecast that ClimateWorks has used for its emissions baseline.<sup>13</sup> ClimateWorks has not, however, estimated the emissions saving from adoption of a given abatement option on the basis of the *net* savings in emissions in the year in question. In other words it has not discounted the *gross* savings in emissions that it has estimated for that part of the gross savings that are expected to be realized under any realistic BAU scenario.

Identifying the abatement options that would be implemented under a BAU scenario and when they would be implemented is clearly a difficult exercise. To ignore these savings completely, however, is to overestimate substantially the emission savings that can be made against the BAU level. The key is to focus on estimating the scope for accelerating the rate of emission savings compared to its long term trend.

Based on recent historical gains in energy efficiency of about 0.5 per cent a year, the overestimate of the emissions savings potential of the options that have been proposed by ClimateWorks could amount to as much as 70 million tonnes of CO<sub>2</sub>-e in 2020.<sup>14</sup> This implies an overestimate of more than 28 per cent.

---

Research Report 06.26, ABARE, Canberra; IEA [International Energy Agency], 2007, *Energy Use in the New Millennium — Trends in IEA Economies*, OECD/IEA, Paris; and Suwin Sandu and Arif Syed, 2008, *Trends in Energy Intensity in Australian Industry*, Research Report No 08.15, ABARE, Canberra.

<sup>10</sup> The Treasury, 2008, *Australia's Low Pollution Future: The Economics of Climate Change Mitigation*, Canberra, Box 3.5, p. 50

<sup>11</sup> Productivity Commission, 2005, *The Private Cost Effectiveness of Improving Energy Efficiency*, Inquiry Report No 36, Canberra, 31 August. The Commission's estimates were based on estimates of the trends in energy intensity in Tedesco and Thorpe 2003.

<sup>12</sup> Sandu & Arif Syed 2008

<sup>13</sup> Department of Climate Change 2009

<sup>14</sup> An annual improvement in energy efficiency of 0.5 per cent means that energy efficiency in 2020 would be 90.5 per cent of its level in 2000. Without those energy efficiency gains, the BAU baseline emissions in 2020 would have been 734 Mt of CO<sub>2</sub>-e (= 664 Mt of CO<sub>2</sub>-e ÷ 0.905).

### 3. Abatement Cost Curve Understates Direct Costs

The report by ClimateWorks focuses on what it describes as the ‘techno-engineering costs’ of the abatement options that it has identified as facing Australia. These costs consist of the capital and operating costs of each option estimated over its life cycle on the basis of a discount rate of 7 per cent in real terms.

On the face of it this approach omits many of the direct costs of abatement:

- the additional infrastructure that would be required by Australia’s energy transmission and distribution networks;
- the additional costs involved in managing the operation of the National Electricity Market (NEM);
- the opportunity costs of the natural resources required for some of the abatement options;
- the cost of public administration to implement the policy measures needed to realise the emission savings; and
- the compliance costs imposed on the private sector by the implementation of these policy measures.

These are elaborated in turn.

#### 3.1 Additional electricity infrastructure costs

A number of the abatement options involved the construction and operation of 9.5 GW of electricity generation capacity based on a range of renewable energy resources. They were onshore and offshore wind (5.3 GW), solar thermal and solar photovoltaic (3.2 GW), biomass and biogas (0.7 GW), and geothermal resources (0.3 GW).<sup>15</sup> To put the proposed capacity into perspective, it would exceed Victoria’s current generation capacity.<sup>16</sup>

To be effective, the proposed renewable energy resources would have to be connected to the electricity transmission and distribution infrastructure that forms the backbone of the National Electricity Market (NEM).<sup>17</sup> Most of the higher quality renewable energy resources are not necessarily located close to the existing infrastructure and the costs of linking them to it are substantial. In Australia, the capital costs alone are estimated to be around \$200,000 per kilometre of transmission line.<sup>18</sup> Moreover energy is lost — as heat, etc — as it is transmitted from generator to user. The rate of loss increases with the

---

<sup>15</sup> ClimateWorks 2010, p. 108-112

<sup>16</sup> The proposed capacity would not, however, be able to deliver the same amount of electricity in a given time due to the intermittent nature of the renewable energy resources in question.

<sup>17</sup> The NEM consists of the inter-connected electricity generators and users in South Australia, Victoria, Tasmania, New South Wales, the Australian Capital Territory, and Queensland.

<sup>18</sup> Thomas & James 2008

distance over which it has to be moved. At present transmission and distribution losses in the NEM are around 8 per cent on average.

In estimating its abatement cost curve ClimateWorks has included an allowance of \$40 per MWh of renewable energy sent out in 2020 to cover these infrastructure costs.<sup>19</sup> As the report declines to indicate how much electricity it expects the proposed capacity to generate, one cannot determine the total infrastructure cost that has been included in the cost curve, with any confidence.

The use of a uniform assumption for such a large tranche of renewable energy capacity runs the very real risk of underestimating the infrastructure cost for half of the proposed capacity, if not a good deal more. The fact that the allowance is expressed in terms of the energy that is expected to be sent out, rather than as a fixed amount per unit of generating capacity must substantially increase that risk.

### **3.2 Increased cost of managing the NEM**

Due to the physical properties of electricity, generation and usage must be balanced across the grid in real time to maintain its stability. Instability can spread quickly and lead to cascading and widespread power failures. For this reason a central authority — or system controller — is usually appointed to maintain stability and facilitate communication between generators and users. In the NEM this function is performed by the Australian Energy Market Operator (AEMO).

Among other things, AEMO contracts with electricity generators to ensure there is sufficient generating capacity on hand at short notice to meet any unexpected increases in demand or to cover for any disruptions to supply. The generators that provide this operating reserve have to be able to reach their promised capacity in a matter of minutes. In the case of coal-fired generators and some gas-fired ones, this means that have to be spinning while on standby due to the long lead times involved in firing them up.

Electricity generated from most renewable energy resources is far more intermittent and random than that produced from coal or gas. These characteristics increase the challenge of managing the operation of the NEM so as to exploit the energy potential of such resources. The challenge is enhanced by the low density nature of the NEM — with relatively dispersed generators and loads distributed over a 'long and thin' stretching from the Eyre Peninsula to Cairns. The length and thinness of the grid mean that the physical consequences of pronounced variations in electricity supply from renewable energy resources tend to be localised and therefore much harder to deal with from an operational perspective.

As a consequence AEMO has to contract significantly more reserve capacity for each MWh that is generated from renewable sources, compared to coal- or gas-fired generation. Any switch to renewables will, therefore, involve additional expenditure on such capacity. Most of the additional operating reserve will tend to be gas-fired, which means additional greenhouse gas emissions. This is notwithstanding the fact that the electricity generated from renewable would produce little or no greenhouse gas emissions.

---

<sup>19</sup> ClimateWorks 2010, p. 108-112

In estimating its abatement cost curve ClimateWorks has included an allowance of \$5 per MWh of renewable energy sent out in 2020 to cover the costs of the additional operating reserve required by its proposed renewable energy options.<sup>20</sup> The report does not, however, indicate how this allowance was calculated, so its validity cannot be confirmed. It is also silent on whether and how it has allowed for the additional greenhouse gas emissions that would be generated by the additional operating reserves.

For the reasons that were outlined in the previous section, the use of a uniform assumption for such a large tranche of renewable energy capacity runs the very real risk of significantly underestimating the costs involved.

### 3.3 Option value of natural resources

Some of the abatement measures identified by ClimateWorks would have significant opportunity costs associated with the natural resources involved in their implementation. Opportunity costs represent the value that is foregone as a consequence of the resources in question being used to reduce greenhouse gas emissions. The value foregone is that associated with the next best alternative use of the resources in question. It may be thought of as their option value forgone.

The abatement cost curve proposed by ClimateWorks includes options for the afforestation of pasture and cropland, reafforestation of land, reduced deforestation of forest land, and changes in agricultural practices on crop and pasture land.<sup>21</sup> All of these options entail the land owner or land operator foregoing income from the production of logs, timber or agricultural commodities on the land in question. They would also forego the option to switch their land use in the future, should a future change in relative prices make such a switch more profitable for them.

Due to their individualised, highly specific and counterfactual nature, opportunity costs can be difficult for third parties to quantify in advance. The Productivity Commission has, however, attempted to do so in relation to the regulatory restrictions on clearing native vegetation on farm land.<sup>22</sup> It estimated current and future agricultural returns to cleared and uncleared land in two rural shires in NSW and Queensland based on assumptions about future productivity growth, input costs and output prices. Its results suggest that the opportunity costs of extensive clearing restrictions are significant under a wide range of scenarios. In one shire it estimated the opportunity cost to the landowners was between \$27 million and \$84 million and, in the other, between \$42 million and \$124 million.

The Productivity Commission's estimation results are highly sensitive to the assumptions made and therefore cannot be readily extrapolated to other regions in the two States or to other States and Territories. Nevertheless they provide an indication of the orders of magnitude that are likely to be involved.

---

<sup>20</sup> ClimateWorks 2010, pp. 108-112

<sup>21</sup> ClimateWorks 2010, pp. 116-117 & 127-131

<sup>22</sup> Productivity Commission, 2004, *Impacts of Native Vegetation and Biodiversity Regulations*, Inquiry Report No 29, Melbourne, 8 April

The report by ClimateWorks does not indicate that it has made any allowance for these opportunity costs for its proposed forestry and agricultural abatement options.

### 3.4 Administration & compliance costs ignored

ClimateWorks ignores the additional costs in public administration and private sector compliance costs that would be involved in implementing the abatement options it has proposed.

Although ClimateWorks has recommended that the introduction of ‘a price for carbon’, it explicitly avoids identifying the nature of the regime that would be necessary to realise the emission cuts that it has proposed. McKinsey Australia, however, has rationalised this approach on the basis that differences in policy approach would not affect the economic cost associated with a given level of emissions abatement:

‘Whether they are subsidised by governments [sic], passed through to consumers or paid for by businesses, we assume that the underlying economic cost remains the same.’<sup>23</sup>

This assumption is incorrect. The form and extent of any government intervention to cut greenhouse gas emissions is critical to the cost imposed by the intervention on the economy. Different forms of intervention make different demands on public administration to design and implement. This affects the resources that the public sector needs to draw upon. Different forms of intervention also create different incentives for the private sector. Different incentives mean different responses by those affected by the intervention. Finally different responses make for differences in how the private sector uses the resources at its disposal.

The issues can be illustrated by comparing the impacts of a carbon tax with and an emissions permit scheme on the basis that both deliver the same volume of emission cuts. In both cases the explicit and implicit tax rates are the same but the distribution of the revenue raised is different. In the case of the carbon tax it flows to the government and can be used to lower other taxes. In the case of most emissions trading schemes that have been proposed, some or all of the revenue is retained by the owners of the emissions permits.<sup>24</sup>

Other things being equal the costs of public administration and private sector compliance that are associated with an emissions trading scheme may be expected to be higher than those under a carbon tax regime, other things being equal. This is because a system of tradable emissions permits can be expected to involve more and more complex rules than a carbon tax, if only because of the need to record and track the ownership and transfer of each and every permit that is issued by the government in question, on top of ensuring that the permit owners comply with the relevant terms and conditions.

ClimateWorks acknowledges that it has ignored the transactional costs that would be required to implement the abatement options it has identified.<sup>25</sup> They include the cost of public administration and private sector compliance (red tape) that are outlined above.

---

<sup>23</sup> McKinsey Australia 2008, p. 9

<sup>24</sup> This assumes that the emission permits are not auctioned off by the government that issues them.

<sup>25</sup> McKinsey Australia 2008, p. 9

Given the nature of the policy responses that are likely to be required to realize the emission cuts identified by McKinsey, such costs are likely to be substantial.

The potential extent of the private sector compliance costs in question can be illustrated by the experience with the established 'cap and trade' emission abatement regimes around the world. The most successful of these has been the regime used to regulate point-source emissions of sulphur dioxide by industry in the US.

Most of the production units that are covered by the US sulphur dioxide emission regime are required by law to monitor their emissions continually and report the results to the US Environmental Protection Agency (EPA) in real time. In 1998 the annual cost of monitoring compliance under the regime has been estimated at US\$124,000 per production unit.<sup>26</sup> Based on present-day prices and exchange rates, this cost is equivalent to around A\$200,000 per point-source per year.<sup>27</sup>

It should be noted that this estimate does not include the costs of developing the current system of compliance or the annual administrative costs that are incurred by the US EPA in supervising the operation of the regime. These are also likely to be substantial.

A similar system for monitoring compliance would undoubtedly have to be developed and implemented were the Australian Government to implement either a tradable permit regime for greenhouse gas emissions in Australia or a tax on such emissions. Given the numerous and extensive point-sources of greenhouse gas emissions, as well as the number of gasses that are involved, it is very hard to see the compliance and administration costs being lower than those that currently prevail under the US sulphur dioxide emission regime. It is far more likely that they would be substantially greater.

---

<sup>26</sup> Richard Schmalensee, Paul L. Joskow, A. Denny Ellerman, Juan Pablo Montero, Elizabeth M. Bailey, 1998, 'An Interim Evaluation of Sulfur Dioxide Emissions Trading', *Journal of Economic Perspectives*, 12(3), Summer, pp. 53-68

<sup>27</sup> Based on an exchange rate of US0.80 to A\$1.00

#### 4. Abatement Cost Curve Ignores Indirect Costs

The analytical approach used by ClimateWorks to estimate the abatement cost curve is an example of a technique called partial equilibrium analysis. While partial equilibrium analysis has many advantages, it ignores any economy-wide impacts that might occur.

A partial equilibrium analysis is a shortcut method of economic analysis. To make the analysis more tractable and economical, it focuses on the relationship between two strongly-related economic variables — in this case the volume of emission savings and the direct cost of the options — while assuming that everything else does not change. This approach can provide a good approximation of the relationship in question provided none of the other variables change as a consequence. The scale of the aggregate emission savings proposed by ClimateWorks, however, means that many of the other variables in question are likely to change, and change substantially.

Nevertheless, the ClimateWorks report asserts that ‘a portfolio of prompt action is required’ including the introduction of ‘a price for carbon’, that its proposals would ‘achieve maximum emissions reduction at lowest net cost to the economy’, and that delay would be costly.<sup>28</sup> Although the ClimateWorks report was silent on how its proposed emissions reductions should be achieved, the potential impacts from and differences in policy implementation can be expected to be significant from an economic perspective.

Introducing ‘a price for carbon sounds very much like an emissions permit regime, a carbon tax, or some combination of the two. Implementation of any of these alternatives would induce significant changes in the structure of the Australian economy, given its strong reliance on fossil fuels. They would change the relative prices of all fossil fuels immediately. Perhaps more importantly, they would also create expectations about how the policy settings in question would be likely to evolve henceforth.

Even if it were possible to implement emission reductions on a precise source-by-source basis — which it clearly is not — the immediate changes in the use of fossil fuels would still be enough to affect virtually all other prices in the economy, in proportion to their emissions intensity. Notwithstanding the assertion of the ClimateWorks report to the contrary, these price changes would affect the structure of economic activity.

These changes are likely to be amplified by the impact of the abatement measures on expectations, particularly those of prospective investors in energy-intensive industries. The only questions are how much the economy would change and over what time horizon.

Such economy-wide impacts can only be captured in an internally consistent manner by a general equilibrium analysis of the abatement options. Such an approach uses a computable general equilibrium (CGE) model of the economy, which describes all the relationships between businesses, households and the government in mathematical terms.

---

<sup>28</sup> ClimateWorks 2010, p. 3. It should be noted that public policy can aim to maximise the reduction in greenhouse gas emissions or it can seek to minimise the costs of reducing such emissions but it cannot achieve both goals at the same time. This is a logical impossibility.

As ClimateWorks has not used CGE modeling to estimate its abatement cost curve, it has ignored the economy-wide impacts its options would generate. An idea of the importance of these omissions may be gleaned from a CGE analysis of the US abatement cost curve estimated by McKinsey.<sup>29</sup> The results indicate that the loss of GDP from abatement in the US was a magnitude greater than the loss McKinsey estimated for Australia, and was greater again than the Climate Works estimate for Australia.<sup>30</sup> Given the greater reliance of the Australian economy on fossil fuels, the McKinsey and ClimateWorks estimates are simply not plausible and call into question their common methodology and approach.

The main impacts that have been omitted from their cost estimates are:

- substitution of fuels within industry;
- changes in electricity prices; and
- the increased risk & uncertainty associated with the proposed cuts.

Each of these is discussed in turn below.

#### **4.1 Increased gas prices from fuel substitution**

ClimateWorks proposes a switch in the fuel mix used by industry away from coal and towards natural gas. The options include replacing 4.5 GW of coal-fired generation plant with gas-fired plant and increasing the availability of gas-fired plant to 60 per cent.<sup>31</sup>

Other things being equal, any shift to gas will increase domestic demand for natural gas. This, in turn, would increase the real price of gas over the short to medium run compared to the price that ClimateWorks has assumed for its analysis. The long run impact on domestic gas prices would depend upon the ability of existing producers to expand output from existing fields and to find and develop new fields. That said, there is no certainty that new domestic gas supplies would come on stream over the medium to longer term or, if they did, that they would keep real gas prices at the levels assumed by ClimateWorks.

Even if it were possible to implement the mission reduction options on a source-by-source basis, which it clearly is not, the extent of the switch to gas would be reduced, but it could not be eliminated completely. CRA International has provided a useful illustration of the potential impact.<sup>32</sup> With a carbon price of \$30 per tonne of CO<sub>2</sub>-e, it estimated that doubling of the real price of gas would cut the additional gas consumption by three-quarters. On the other hand, if the carbon price was \$60 per tonne, doubling the gas price would more than halve additional gas consumption more than halved.

The increase in the delivered price of natural gas in Eastern Australia would adversely affect all gas users. The most severe impacts would be felt by the trade-exposed industries, which would suffer a loss of competitiveness proportional to their energy intensity. Although some of this loss is likely to be dissipated by a real depreciation of the Australian dollar, the net effect is still expected to be negative.

---

<sup>29</sup> McKinsey 2007

<sup>30</sup> Thomas & James 2008

<sup>31</sup> ClimateWorks 2010, p.114

<sup>32</sup> Thomas & James 2008

## 4.2 Increased electricity prices & their downstream impacts

One consequence of any switch from coal to gas in electricity generation would be an increase the wholesale price of electricity in real terms. On the basis of present fuel prices and generation technologies, gas-fired generation costs around 30 per cent more per MWh of electricity sent out, compared to generation from coal.<sup>33</sup>

The CGE modeling by the Commonwealth Treasury of the Government's proposed Carbon Pollution Reduction Scheme (CPRS) illustrates the potential scale of the impact of emission abatement on wholesale electricity prices, even after allowing for the damping feedback on electricity demand from increasing electricity prices.<sup>34</sup> On the basis of that the CPRS would achieve an emissions cut in 2020 of 5 per cent against the 2000 emissions level, the Treasury estimated that wholesale electricity prices would, on average, be 48 per cent above the BAU level over the period from 2010 to 2015, and 86 per cent above the BAU level over the period from 2015 to 2020.

While these were the average results for Australia as a whole, the Treasury estimates at the State level showed wide variations. The Treasury estimated that wholesale electricity prices in NSW were 65 per cent higher over the first five year period (2010-15) and 108 per cent higher over the second period (2015-20). It also estimated that wholesale electricity prices would be 57 per cent and 120 per cent higher in each of the periods in Victoria and 66 per cent and 109 per cent higher respectively in Queensland.

Any increase in electricity prices caused by the emission reductions identified by McKinsey would adversely affect electricity users in industry and in domestic households. As a consequence, the trade-exposed industries would suffer a loss of international competitiveness in proportion to the intensity of their electricity use. The adverse impact is likely to be attenuated by a real depreciation of the Australian dollar but the net effect is still expected to be negative.

Based on the national accounts, the domestic industries that would be most adversely affected by the rise in real electricity prices would be:

- iron and steel;
- non-ferrous metal products;
- electronic products;
- glass and glass products;
- cement, lime and slurry; and
- pulp, paper and paperboard.<sup>35</sup>

---

<sup>33</sup> Australian Energy Regulator, 2009, *State of the Energy Market 2009*, Australian Competition and Consumer Commission, Melbourne, p. 52

<sup>34</sup> Treasury 2008, Table 6.14, p. 176

<sup>35</sup> These results reflect estimates by ITS Global at the four-digit level of the Australian and New Zealand Standard Industrial Classification (ANZSIC) based on the latest Input-Output Tables published by the ABS for the Australian economy (See ABS [Australian Bureau of Statistics], 2006, *Input-Output Table: 2005-06*, Cat. 5209.0.55.001, Canberra [accessed at [www.abs.gov.au](http://www.abs.gov.au) in April 2010]).

### 4.3 Increased risk & uncertainty

The McKinsey abatement cost curve also ignores the impact of increased risk and uncertainty on the Australian economy, as a consequence of the government interventions that would be necessary to implement the proposed abatement options. This is also true of most CGE modeling of abatement options.<sup>36</sup>

In considering these issues the distinction between risk and uncertainty is critical. Risk is where both the nature of the outcomes from a proposed action and the mathematical frequency of their occurrence are considered to be well-established. The classical example of risk is the toss of a (fair) coin. Uncertainty, on the other hand, means that either the nature of the outcomes or the frequency of their occurrence (or both) is unknown to the decision-maker (and indeed unknowable).

In the real world, uncertainty generally has a far greater influence on decision-making than risk, properly understood. This is a reflection of the 'knowledge problem'.<sup>37</sup>

- There is profound ignorance about the future value of many or most economic parameters. This reflects the inherently subjective nature of all economic value.
- Much of the knowledge that is economically important is tacit. Only the individual is aware of what he or she is prepared to give up in exchange for something, and then often only when presented with a concrete choice.
- Tacit knowledge is difficult, if not impossible, to formalise. It is therefore highly resistant to centralization within an organization or institution. Consequently, there are severe limits to centralised decision-making.

Uncertainty means that economic agents have to invest resources to reduce the uncertainty in economic transactions to which they are exposed or to insulate themselves from the consequences of that uncertainty. To the extent that they are unable to do so, business people will be actively discouraged from investing in the new products, business process, and the development of new markets that are the key to productivity growth for the economy and enhanced living standards for the community as a whole.

The strategies to reduce or ameliorate uncertainty in economic transaction involve the search for the right people with whom to transact, the negotiation of a suitable contract with them, monitoring their performance under the contract, and enforcing its terms. Such costs are known as transaction costs in the economic literature.

---

<sup>36</sup> CGE modelling can incorporate stochastic variables where the frequency distributions of the outcomes are able to be estimated but the data that are required for such estimates are generally not available.

<sup>37</sup> Friedrich von Hayek was awarded the Nobel Prize in Economics in 1974 for articulating the nature of this problem and its limitations. A succinct outline of the issues are in FA von Hayek, 1937, 'Economics and Knowledge', *Economica*, 4(13), February, pp. 33-54, and —, 1945, 'The Use of Knowledge in Society', *American Economic Review*, 35(4), September, pp. 519-530.

In accordance with the approach developed by McKinsey, ClimateWorks has consciously ignored transaction costs in estimating the costs of its abatement options because they were difficult to quantify.<sup>38</sup> The transaction costs in question include the opportunity costs of the time of business executives and their staff in identifying, evaluating and implementing options to increase energy efficiency and decrease greenhouse gas emissions.

As a consequence of this omission ClimateWorks has concluded — wrongly — that nearly a quarter of their abatement options would generate a ‘net benefit’ for the economy as a whole.<sup>39</sup> In other words there are abatement options facing industry that would generate a net economic benefit for the businesses that could implement them but they consistently fail to do so. This is not a credible result. It presupposes that there is a ‘free lunch’ or ‘magic pudding’ in cutting greenhouse gas emissions but ignores the substantial transaction costs involved in doing so and the incentives that they create for the businesses in question to be ‘rationally ignorant’ about the savings.

To implement these emission savings the businesses in question would have to:

- identify the prospective new technologies or modifications to an existing technology — in areas in which they may have only rudimentary knowledge;
- evaluate the technical, operational and financial implications of each of the options for the implementation of the technology;
- select, design and implement their chosen approach;
- monitor its performance over time against the business objectives set for it; and
- adjust its implementation in the light of that experience

Such activities consume real resources, particularly the time of the senior executives and specialist staff of the business that is taken up with the above activities. While the out-of-pocket costs involved in doing so may be trivial, as ClimateWorks tends to imply, this does not mean that the value to the business of the executive and staff time that is involved in them is not. This has to be measured in terms of the opportunity cost of that time in terms of what profitable opportunities the business had to forgo, as well as the uncertainty to which the operational business was exposed as a consequence.

CGE models can incorporate the economy-wide impacts of large-scale emissions cuts and the mathematical probabilities of their prospective impacts, if they are known. It is very hard, if not impossible however, to incorporate specific transaction costs in such models, let alone uncertainty in any comprehensive sense of that term. Part of the reason is the highly heterogeneous nature of uncertainty and the transaction costs that may be incurred to reduce or ameliorate it.

The nature of the recent debate in Australia over man-made climate change, its economic consequences, and the most appropriate policy response to it has greatly exacerbated the uncertainty faced by business. The increased uncertainty has been most pronounced for

---

<sup>38</sup> ClimateWorks 2010, p. 12. McKinsey 2007 & 2008

<sup>39</sup> ClimateWorks 2010, p. 2

those business activities that operate at a relatively high level of emissions intensity, such as electricity, transport, agriculture, mining and most heavy manufacturing industry.

The unresolved debate over the appropriate policy response to the issue of increasing man-made emissions of greenhouse gases at both the national and international level has increased the uncertainty faced by Australian business. The businesses, which are most adversely affected by this uncertainty, are those in capital-intensive sectors based on individually large and long lived assets with a heavy reliance on fossil fuels or electricity generated from fossil fuels. They include electricity supply, iron and steel, non-ferrous metal products, electronic products, glass and glass products, cement, lime and slurry, and pulp, paper and paperboard.

The Commonwealth Government has twice tried unsuccessfully to have the Parliament pass legislation to implement its proposed Carbon Pollution Reduction Scheme (CPRS). Nevertheless, both times many of the more important details of the Scheme and its operation were to be left to subordinate legislation, which the Government has yet to reveal publicly. The Government's decision to shelve the CPRS until 2012 has only exacerbated the uncertainty.

Moreover the CPRS is predicated upon an agreed set of integrated and coordinated policy responses being agreed by the parties to the UN Convention on Climate Change (UNFCCC). The current national commitments to reduce emissions in the Kyoto Protocol to the UNFCCC are due to expire in 2012. There is, however, no sign of what, if anything, will replace the Kyoto commitments, or when these issue will be resolved.

The policy hiatus is likely to continue for the foreseeable future and, in the meantime, will have an adverse impact on business investment and innovation, especially in the more emissions intensive sectors of the economy. This in turn will mean that GDP and living standards in Australia can be expected to be lower than otherwise would be the case. In the long run, the key to higher living standards is sustained growth in productivity, the key productivity growth is investment in business innovation, and the key to investment is to minimize uncertainty.

None of these uncertainties have been incorporated into the Australian abatement cost curve that was estimated by ClimateWorks. None have even been canvassed in its report. This is most surprising given that ClimateWorks cost estimates require the electricity sector to invest more than \$44 billion in new generation capacity, over and above the investment that will be required to sustain 'business as usual' in the sector.

The ClimateWorks report makes no attempt to grapple with how its estimates might vary with changes in their underlying assumptions. In particular, it completely ignores how sensitive the abatement cost in Australia is to the nature and extent of any abatement measures that might be implemented in parallel by each of its major trading partners.