

Renewable Energy in Australia: Current Status and Future Prospects

Paper to the International Bar Association Conference: Singapore 14-19 October 2007

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ABSTRACT

Australia has one of the highest per capita rates of greenhouse gases emissions in the world. While a range of policies and voluntary programs have been implemented, the uptake of renewable energy remains very low. The reasons are complex, involving a mix of inadequate incentive mechanisms, institutional barriers, political inertia and legal constraints. Most telling of these has been the reluctance (until very recently) of the Federal Government to properly price the externalities associated with fossil fuels and embrace significant reforms that require deep cuts to emissions. This has been a longstanding policy approach based largely on the perceived likelihood of severe economic consequences. However, in the last 18 months there has been a significant shift in policy direction and it is likely that Australia will eventually embrace a national emissions trading regime either in 2010 or 2012. This paper first explores the current status of renewable energy before identifying the various schemes that have been developed to date. It will then explore some of the key barriers to the growth in the renewable energy sector. These will include institutional, pricing, regulatory and legal barriers. A specific example of a proposed wind farm in New South Wales will be discussed highlighting some of the key issues that face opponents of renewable technology for electricity generation. Finally, suggestions are made for further measures which could increase proportion of electricity generated from renewables in the Australian context.

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1. Introduction

The Commonwealth Scientific and Industrial Research Organisation (CSIRO) reported in 2006 a range of predicted impacts on Australia from climate change. These included:

- By 2030 average daily temperature to rise by 0.5°C to 1.5°C
- By 2070 average daily temperatures to rise 0.7 to 5.0 above 1990 levels
- Widespread decrease in atmospheric moisture over most of the continent
- Increase in extreme rainfall events and the like
- Increase in fire weather conditions
- Relative to 1990, increase in sea levels from 3-10 cm in 2030 to 7-52cm by 2070.²

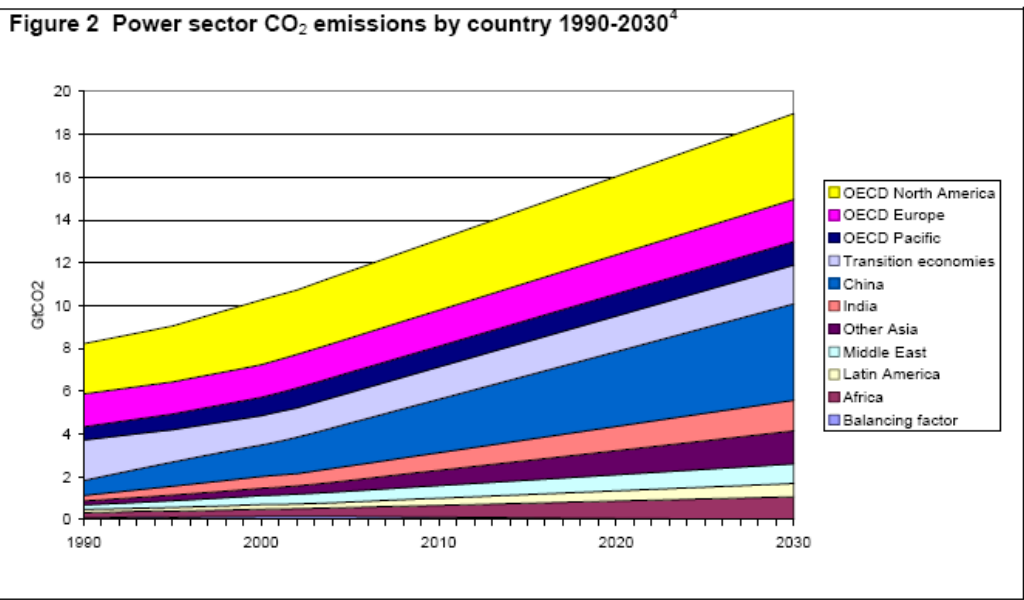
Australia is currently experiencing a particularly severe drought.³ In many areas, drought conditions have existed for over seven years. This, together, with a range of other factors, has contributed to a significant new awareness about climate change in the community, media and political sphere. This has been reflected in a growing interest in how we produce electricity which is responsible for about one third of Australia's greenhouse gas emissions.

In Australia electricity demand in the last 20 years has grown by approximately 4% per year, effectively doubling over the last two decades. Thus the contribution of electricity generation to carbon emissions is increasing. This reflects the international trends identified in the Stern Report.⁴

² CSIRO, (2006), *Climate Change Impacts on Australia and Benefits of Early Action to Reduce Global Greenhouse Emissions*.

³ Australia has one of the most variable rainfall climates in the world. Over the long term we have about three good years and three bad years out of ten. These fluctuations have many causes, but the strongest is the climate phenomenon called the Southern Oscillation. This is a major air pressure shift between the Asian and east Pacific regions - its best-known extreme is El Niño. Meteorology's greater understanding of El Niño has improved its ability to predict seasonal rainfall and help authorities and individuals with early drought warnings. More information is in the Bureau's brochure *Climate Variability and El Niño*, or on the World Wide Web at <http://www.bom.gov.au/>.

⁴ See *Stern Review on the Economics of Climate Change*, HM Treasury, London, 2006, annexe 7.b, Emissions from the Power Sector,



Electricity generation is a major primary energy user, equal to around 40% of total primary energy. In Australia, renewable technologies currently supply around 8% of electricity consumed, coal around 77%, gas supplies 14% and oil 1%.⁵

Energy production and use contributed 68% of Australia's greenhouse gas emissions in 2002 and is expected to be 72% by 2020. Non-transport energy use accounts for 53% and transport 14%. Energy sector greenhouse emissions are expected to grow by more than 30% by 2020. Electricity is the biggest source of energy emissions accounting for two thirds of stationary energy emissions. As coal is the major source for base load electricity generation, its combustion accounts for 92% of electricity emissions.

The high abundance and cheap cost of coal and to a lesser extent natural gas produces significant differentials in the marginal cost of electricity supply compared with renewable technologies. Thus market forces alone would not produce the incentives necessary for whole scale investment in renewables. As greenhouse gas emissions are presently an unpriced externality, the current policy regime has two serious consequences:

- it encourages over consumption of cheap electricity; and
- it results in the overuse of the atmosphere as a receptacle for significant greenhouse emissions.

The development of quasi economic policy instruments in the environmental area has gathered significant momentum in recent years. The use of prohibitions, permits, licensing and approval for harmful activities, criminal and civil enforcement mechanisms and broader sanctions for non-compliance remain the primary focus of much of Australia's environmental law and policy. However, particularly in the area of pollution and resource consumption, there have been a wide variety of economic tools incorporated into the regulatory framework.

In the area of energy policy, these instruments are now considered to be a critical component of the legal and policy setting. As such they play an important adjunct to command and control mechanisms. The policy and programs to date have provided some incentive for the growth in renewable technology sector. However, far more needs to be

⁵ Energy In Australia 2005, Australian Bureau of Agriculture and Resource Economics, (ABARE).

achieved in this area for there to be a significant shift in electricity generation and consequent reductions in greenhouse emissions.

The first part of this paper outlines the current status of the renewable technology industry in Australia before discussing some of the key laws, policies and programs supporting the industry.

2. The current status of renewable energy in Australia

The sun, wind, waves, rivers, tide and heat from radioactive decay in the earth's mantle are all abundant and ongoing. Thus they are described as renewable. Arguably so too are fossil fuels, but time to create and renew reserves and the scale of consumption precludes their inclusion.

By their nature, renewable technologies are variable and diffuse. Often located away from urban centres, they present significant challenges, in particular reliable means of storage and the need for duplicate sources. Of the technologies available, the only one that has been widely developed for many years has been hydro electricity, though the uptake of wind power is increasing.

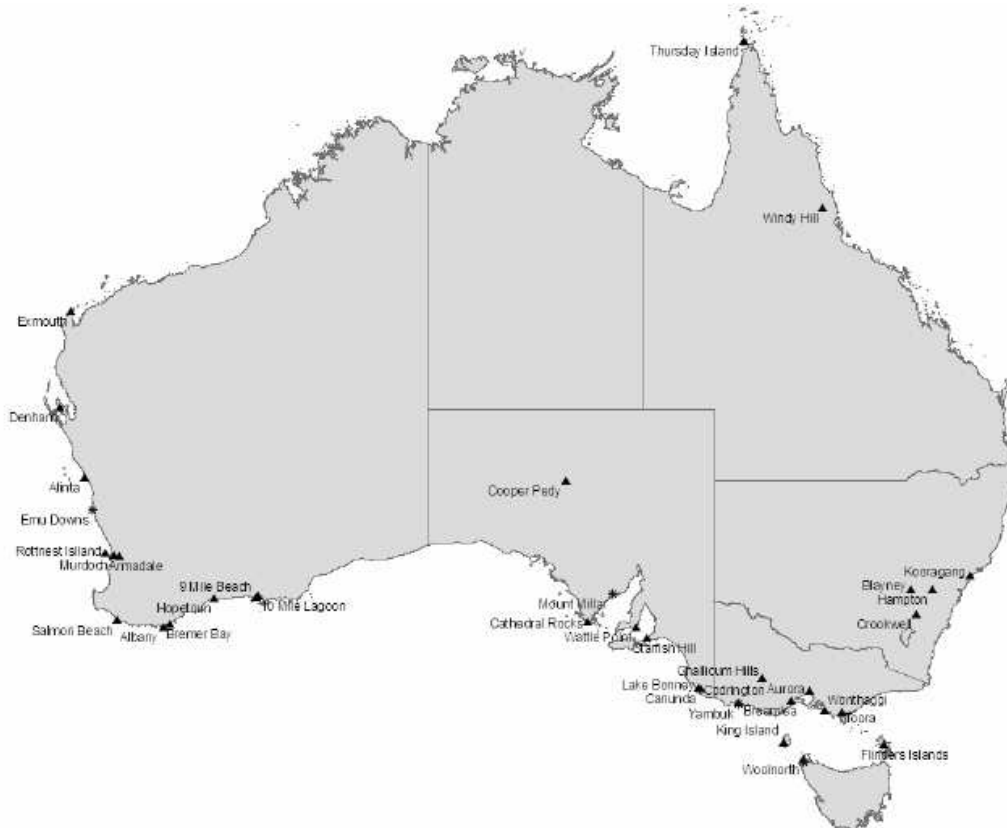
Until the early 1990s, the rate of growth of total energy consumption generally closely matched the rate of growth in gross domestic product (GDP). However, energy consumption has tended to grow more slowly than GDP since that time. The decline in the 'energy intensity' of the Australian economy has been attributed to two main factors. One is an increase in energy efficiency due to technological advancements and fuel substitution. The other is the rapid growth of less energy intensive sectors, such as the services sector, compared to lower rates of growth in more energy intensive sectors such as manufacturing and mining.

Australia's energy consumption is dominated by coal, petroleum and natural gas. However, renewable energy sources are increasing. The renewable technologies currently utilised in Australia include:

- Bioenergy
 - bagasse
 - cogeneration
 - digesters
 - pyrolysis
 - landfill gas
 - municipal solid waste
 - sewage gas
- Hydropower
- Power from the ocean
 - tidal
 - wave
- Photovoltaics and assorted technologies
 - flat plat modules
 - concentrating systems
- Solar water heating
 - high temperature solar thermal
 - residential systems
- Wind energy⁶

⁶ Australian Business Council for Sustainable Energy, (2006), *Australia's Renewable Energy Use and Services*, p 5

In capacity terms, 8,229 MW of renewable power generation from 254 projects were in place at 31 December 2005. The sector supports direct employment of approximately 6000 people. The growth in the sector by sales is from around \$1.1 billion per annum in 2000 to over \$1.8 billion during 2002-03. From a small base, exports have ground to more than \$250 million in 2003. The growth in renewables has mainly come from hydro, solar and wind power. Wind has recently grown substantially with the most projects committed, approved and installed. In 2006, there was around \$1,000MW of wind farms operation or under construction with over 7,000MW of other projects under development. The location of wind farms in Australia is identified below.⁷



By comparison to other countries, Australia's wind energy sector is still relatively small. Australia has around 40 completed wind energy projects totalling around 640MW of wind energy capacity, ranging from small single turbine installations of less than 25kW in remote communities, through to extensive wind farms consisting of more than 50 large (2MW) wind turbines. Four wind farms are currently under construction and will provide a further 254MW of wind energy capacity. As of February 2006 around 440 wind turbines were operating in Australia and nearly 130 turbines were under construction. The size of wind energy projects has also increased significantly. The average size of commercial projects has grown from 10-20 turbines and 10-15MW capacity in 2000, to 30-50 wind turbines and 50-90MW capacity in 2005.

The largest contributor to renewable energy in Australia is hydro power, principally in Tasmania, New South Wales and Victoria. The Snowy Mountains hydroelectric power

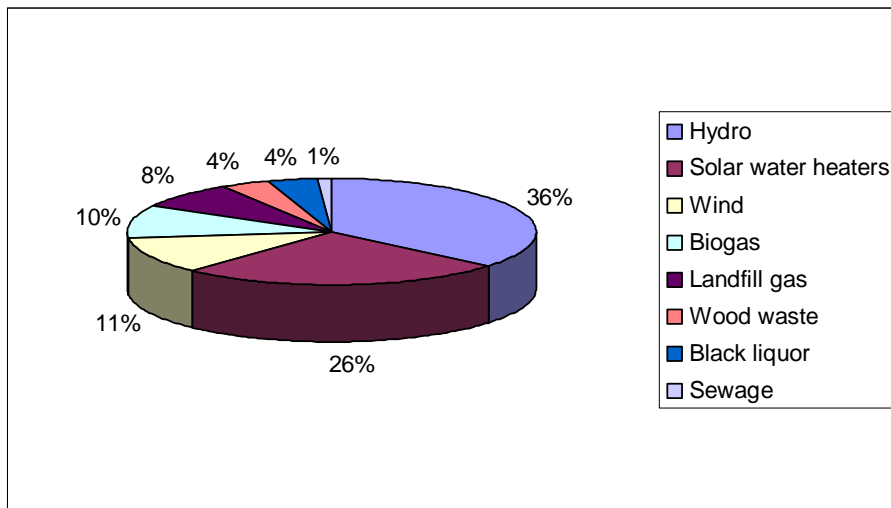
⁷ See Department of Environment and Energy, Australian Greenhouse Office, (2006), *A National Code for Windfarms Discussion Paper*.

scheme is the largest hydro electric system in Australia, with a generating capacity of nearly 3,800 MW. It includes seven power stations, 145 km of tunnels and 16 dams. Tasmania's Hydro-Electric Corporation [6] generates the second largest amount of hydro electricity in Australia. Other hydro stations include: Barron Gorge power station near Cairns(60 MW), Kareeya power station at Tully Falls in Cairns region (72 MW), Somerset Dam power station on the Brisbane River (40 MW), Wivenhoe Dam power station on the Brisbane River (500 MW) and Ord River Hydro in the north of Western Australia (36 MW).

Geothermal resources offer considerable potential via hot dry rocks and hydrothermal reservoirs. These sources are current being tested in Cooper Peedy basin in South Australia and in the Hunter Valley in NSW by a firm called Geodynamics.

Ocean energy is being used in a wave energy plant in Port Kembla, NSW. This 500kw pilot project has performed better than expected in trial and a A\$40 million commercial plant is planned for Portland in Victoria.

The split of renewable energy technologies in 2003 was as follows:



3. Current policies and institutional arrangements supporting renewable energy

There are a range of national and state based schemes in Australia directed towards to reduce emissions and removing greenhouse gases. These include regulatory, voluntary and incentive based programs. Some schemes benefit renewable technologies by target emissions while others are directly aimed at supporting the growth of the sector. These are discussed first at the National level and then at the State and Territory level.

Commonwealth measures

As many would know, along with the USA, Australia has been one of the few industrialised countries that have failed to ratify the Kyoto Protocol. The rationale has been that without developing countries and the USA being committed to the Protocol it will be ineffective and that becoming a party to the Protocol would harm the energy sector and thus Australia's economy and competitiveness. To indicate that it was taking some action, the Federal government embarked on a series of policies and programs (largely voluntary) to reduce greenhouse gas emissions. In the absence of national leadership on setting targets for greenhouse gas reductions, the law and policy has not strongly supported the renewable energy sector. This is not to suggest that some measures have not had an impact. Indeed, some have, in particular, the *Renewable Energy (Electricity) Act 2000* which evolved out of

the Government's white paper issued in 1997 "Safeguarding the Future: Australia's Response to Climate Change".

The Act is supported by the *Renewable Energy (Electricity) (Charge) Act 2000* and the *Renewable Energy (Electricity) Regulations 2001*. The scheme establishes the mandatory renewable energy target (**MRET**). It places a legal liability on wholesale purchasers of electricity to proportionately contribute towards the generation of an additional 9,500 gigawatt hours (**GWh**) of renewable energy annually by 2010.

The legislation is administered by a Federal Government statutory authority, the Office of the Renewable Energy Regulator. Tradeable renewable energy certificates (**RECs**) are created on the basis of eligible renewable energy generation. Each REC is equivalent to one megawatt hour (**MWh**) of renewable generation. The sources and technologies that are eligible include hydro, wind, solar and various biomass sources. There are provisions for dealing with emerging technologies which have not yet been commercialised in Australia such as wave, tidal and geothermal energy.

Accredited generators that commenced operating on or after 1 January 1997 can earn RECs for all eligible electricity following the accreditation. Pre-existing generators can only earn RECs where they have increased their output above a baseline determined by the regulator. An incentive to achieve the 9,500 GW hour target and the interim targets prior to 2010 is achieved by a \$40 per megawatt hour shortfall charge. As noted above, the growth in renewable energy generation has primarily come from hydro and solar hot water sectors, strong growth in the wind sector, although off a relatively small base. Generation from biomass has not been as significant as expected. The scheme has also only had a marginal influence on generation from solar photovoltaics.

The MRET scheme underwent a review in 2006. The review found that uptake was significant and that sufficient capacity is expected to have been installed to meet the MRET target of 9500 GWh by 2007. As a consequence, investment was likely to fall away rapidly. The review recommended a number of fine tuning amendments to the scheme with a steady increase in MRET targets towards a target of 20,000GWh by 2020. While various procedural amendments to the legislation were passed in June 2006, to date the Government has not increased the target. Anecdotally, there have been reports of a substantial decrease in investment in the industry as a result.

New South Wales

New South Wales is the most populated eastern state and has taken a substantial lead in supporting the renewable energy sector. It established one of the first mandatory emission trading regimes on 1 January 2003 through the introduction of Part 8A of the *Electricity Supply Act 1995* (NSW). New South Wales has also led the national debate on the introduction of a National Emissions Trading Scheme and the recently announced Climate Change Fund, worth more than \$300 million.

The emission trading regime developed in New South Wales is called "The Greenhouse Gas Abatement Scheme" (**GGAS**). The scheme commenced on 1 January 2003 and aims to reduce greenhouse gas emissions associated with the production and use of electricity. It aims to achieve this by encouraging project based activities to offset the production of greenhouse emissions.

GGAS establishes annual state wide greenhouse gas reduction targets. It then requires individual electricity retailers and certain other parties who buy and sell electricity in New South Wales to meet mandatory benchmarks. These benchmarks are based on the size of their share of the electricity market. If these parties, known as benchmark participants, fail

to meet their benchmarks then a penalty is imposed. The scheme aims to develop and encourage activities to offset the production of the greenhouse gas emissions.

The scheme imposes mandatory greenhouse gas benchmarks on all holders of electricity retail licences in New South Wales and the Australian Capital Territory. It also applies to electricity generators prescribed by the regulations that supply directly to retail customers as well as certain market customers who take their electricity directly from the national electricity market and which have a market load (as defined) with the National Electricity Market Management Company. These are the mandatory benchmark participants. There are also voluntary participants who include customers within New South Wales with electricity loads of greater than 100 GWh or people carrying out certain state significant development. These elective benchmark participants can manage their own greenhouse gas benchmarks.

Benchmark participants can reduce the average emissions of the electricity they supply or use by purchasing abatement certificates. These can then be surrendered to the compliance regulator.

The scheme allows for the creation of abatement certificates by abatement certificate providers (**ACP**). These providers are those who carry out one or more of the following abatement activities:

- low emission generation of electricity including co-generation or improvements in emission intensity of electricity generation;
- activities that result in reduced consumption of electricity;
- activities carried out by elective participants that reduce on-site emissions not directly related to electricity consumption; and
- the capture of carbon from the atmosphere and forests.

ACPs must apply to the scheme administrator for accreditation in respect of their abatement activity. The scheme administrator assesses the application to validate that the project needs certain eligibility requirements and that abatement can be properly calculated. The scheme administrator operates an on-line registry which enables GGAS to operate effectively as an emissions trading scheme.

The registry itself is not a trading platform as the trading in certificates occurs externally. This can occur either bilaterally, through brokers or through other trading platforms. However where there is a change in ownership of certificates that is recorded on the registry. The scheme is regulated by an auditing framework and a body what is called The Independent Pricing and Regulatory Review Tribunal.

The GGAS scheme continues to grow. In 2006 there were 35 benchmark participants 24 of which were compulsory participants. The total number of all abatement and renewable energy certificates (discussed in detail below) to meet the obligations imposed was equivalent to 13.8 million tonnes of carbon dioxide equivalent. All New South Wales electricity retailers and other benchmark participants demonstrated a reduction or offset of their emissions.

The scheme was originally expected to terminate in 2012. However in 2006 the New South Wales government passed amendments to the relevant provisions of the *Electricity Supply Act 1995* to extend the life of the scheme to 2021 or until a national emissions trading scheme is established.

The relevant legislative framework is established through Part A of the *Electricity Supply Act 1995*, the *Electricity Supply (General) Regulation 2001* and five greenhouse benchmark rules made by the New South Wales Minister for Energy. The Government has introduced mirror legislation to facilitate a single scheme that operates across both jurisdictions. The GGAS scheme is now the world's second largest mandatory emissions scheme second only to the European Union emissions trading scheme that became operational in 2005⁸.

Very recently the New South Wales government formally adopted a target to reduce greenhouse gas emissions to 2000 levels by 2025 and by 60% by 2050. As part of the policy measures to achieve this goal, the Government introduced a bill to establish a renewable energy target. The *Renewable Energy Bill 2007* aims to make a significant contribution to greenhouse gas reductions by aiding the development of a robust renewable energy industry. The bill, if enacted, will require that 10 per cent of electricity consumed in New South Wales by 2010 and 15 per cent by 2020 will have to be supplied by renewable energy, with the 15 per cent level maintained to 2030. The Government maintains that by 2020, the New South Wales mandatory renewable energy target will stimulate an additional 7,250 gigawatt hours of new renewable energy, driving up to \$3.5 billion of investment in the renewable industry across the national electricity market.⁹

Over the life of the scheme, renewable energy generation is expected to total 121,000 gigawatt hours, which will result in greenhouse gas emission savings of about 115 million tonnes. The New South Wales mandatory renewable energy target aims to increase the percentage of electricity consumed in New South Wales from renewable energy sources. It establishes a market-based scheme that is closely aligned to the Victorian mandatory renewable energy target scheme.

The scheme is designed to operate as part of the national Australian Energy Market. Renewable generators. Renewable generators accredited under the New South Wales Energy Target Scheme (**NRET**) will be able to create certificates for each megawatt hour (**MWh**) of electricity generated above the pre-scheme capacity. However they will not be able to obtain certificates where that capacity has been created under another scheme for the same megawatt hour.

Electricity retailers supplying customers in New South Wales as well as customers purchasing directly from the national electricity market, will be required to meet specified targets based on their proportional end use consumption of electricity. Retailers will be required to surrender sufficient renewable energy certificates each year to meet their target or pay a stiff penalty for non compliance. Certain trade exposed electricity intensive industries will not have an obligation to surrender renewable energy certificates.

The scheme aims to treat equally all types of renewable energy generation. That is, each megawatt hour of electricity generated under the scheme will create one renewable energy certificate (**REC**) which may be traded on an equal basis with certificates produced from the same or any other permitted type of renewable generation. This is intended to minimise the cost to retailers and consumers and drive innovation to reduce the cost of renewable electricity production. The scheme will be based on tradeable certificates, similar to the MRET, GGAS and the Victorian Renewable Energy Target Scheme as well as many other environmental market schemes around the world. The price of the tradeable certificate will be determined by the market which should ensure that the least priced and most cost effective renewable energy is at any time utilised. To reduce compliance costs, the New

⁸ World Bank, Washington DC, May 2007 "State and Trends of the Carbon Market 2007", page 3.

⁹ See Honourable Minister Phil Coperberg, "Agreement in Principle" speech to the NSW Parliament 27 June 2007.

South Wales scheme is intended to be consistent with the Victorian scheme (discussed below) and it adopts identical statutory provisions to the *Victorian Renewable Energy Act 2006* (except for explicit policy differences between the two schemes).

While the NRET scheme will complement the GGAS scheme, electricity retailers and other relevant entities under NRET will not be able to count the greenhouse abatement associated with renewable generation certificates towards their GGAS targets. The scheme establishes a linear annual increase in targets to clearly define the levels to be met each year for the lifetime of the scheme. This approach aims to avoid uncertainty for the renewable energy sector which could occur if a re-calculation for each year is undertaken. The scheme is intended to end on 31 December 2030 with a review of the scheme proposed for 2013 after five years of the scheme's operation. Solar water heaters will not be an eligible renewable generation type under the NRET scheme as the scheme is focused on increasing the amount of electricity generated from renewable energy sources.

As the scheme is intended to stimulate the development of new renewable electricity generation projects, only those projects commencing after 1 January 2007 will be eligible. It is proposed that the NRET scheme should not disadvantage the competitiveness of New South Wales industries which manufacture products having relatively high electricity component in their cost structure and is either competing in export markets or with imported goods. Certain key industries may be considered exempt under the scheme including aluminium, non-ferrous metal smelting, steel manufacture, newsprint manufacture and some activities in the chemicals and plastics sector. The Government recognises that the exemptions represent a balancing act between making strong inroads on greenhouse gas emissions while still protecting major local industries deemed to be at risk.

It is proposed that compliance with the scheme be encouraged by applying a penalty in the event that a relevant entity has insufficient certificates to meet its target. The penalty level would also effectively cap the cost of compliance and provide certainty to investors. Where a relevant entity owns a larger number of certificates than required to meet their annual target, the surplus may be carried over to help meet their liability for subsequent use or sold to other parties. The possibility of borrowing to enable entities to bring forward allowances from a future compliance period to meet a compliance obligation in an earlier period was considered. However, it is currently contemplated that borrowing certificates towards a liability will not be allowed under the scheme. To reduce costs of administration, there is currently discussion with the Victorian Government to determine if the essential services commission, which administers the Victorian scheme, may also administer the New South Wales scheme. If this does not eventuate, it is likely that the New South Wales Independent Pricing and Regulatory Tribunal will take on this role. The scheme will ultimately increase the annual electricity bill for New South Wales households but the increases are relatively minor.

Victoria

The Victorian *Renewable Energy Target Act 2006* provides that retailers and wholesale purchasers of electricity will be required to contribute proportionately towards a renewable energy target of an additional 3,274 gigawatt hours (**GWh**) of renewable energy by 2016. This scheme aims to increase the electricity from renewable energy sources to approximately 10%.

The VRET scheme will continue until 2030 a period in which it is estimated that it will reduce greenhouse gas emissions by the equivalent of 27 million tonnes of carbon equivalent. Accredited renewable energy generators that start operation after 1 January 2007 will be able to create renewable energy certificates for a period of 15 years. Eligible

renewable energy sources includes hydro, solar (except solar hot water), wind, geothermal and biomass.

The *Renewable Energy Target Act* supported by the Victorian Government's Renewable Energy Action Plan. The Government supports the target scheme by improving information for consumer demand through informed choice, removing institutional and regulatory barriers for example, the Government release of policy and Planning Guidelines for the Development of Wind Energy Facilities in Victoria and also introduced the *Geothermal Energy Resources Act* in 2005. This Act establishes a framework to facilitate and regulate the exploration and extraction (mainly large scale commercial) of geothermal energy resources in Victoria. The Act:

- provides that heat energy within the earth is vested in the Crown;
- establishes property rights over geothermal energy and resources within particular areas;
- enables the Government to set a royalty on such resources; and
- provides for three different titles including exploration permits, retention leases and extraction licences to regulate geothermal energy use.

In addition, the Government has enacted the *Wind Energy Development Act 2005* which is aimed at establishing a clearer framework for the regulation of wind energy projects. The Government has also supported a renewable energy support fund, established a Victorian solar innovation initiative and established a centre for energy and greenhouse technologies.

South Australia

The South Australian Government recently passed the South Australian *Climate Change and Greenhouse Emissions Reduction Act 2007* (SA). This Act sets a target to reduce greenhouse gas emissions within to at least 60% of 1990 levels by 31 December 2050. The Act covers carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, sulphur hexafluoride, or any other gas stipulated in the regulations. Specifically the Act also aims to increase the proportion of renewable energy generated and consumed in the state so that it comprises at least 20%. This target date is 2014.

South Australia has also made changes to its *Petroleum Act 2000* to facilitate the production of geothermal energy. A discussion paper outlining proposed amendments to the Act was recently open for public comment. It is proposed that the size of a geothermal licence granted is at the Minister's discretion, based on the proponent's demonstrated project plan. This proposal will include maximum licence areas of 10 000 km² for a geothermal extraction licence and 1000 km² for a Geothermal Retention Licence (GRL) or a Geothermal Production Licence (GPL).

Queensland

Queensland is a state rich in coal and mineral resources. It is also the only state that has more people outside its capital and within it. These factors traditionally have contributed to a reliance on natural resources and a reluctance to introduce policies which threaten the economic benefits of resource exploitation. It is not surprising therefore that it has lagged others in measures to address climate change and incentives for renewable energy.

To date the measures adopted include administering the Federal Government's MRET scheme and a Sustainable Energy Innovation Fund.

Exploration for geothermal energy is carried out under the *Geothermal Exploration Act 2004* (Qld) This is interim legislation to enable geothermal exploration to commence whilst work on legislation to enable geothermal production is undertaken. Information is available on the current availability and requirements of making a tender for a Geothermal Exploration Permit including tender areas, assessment criteria, gazette notice and details of fees, closing date and lodgment address.

Guidelines have been produced for the geothermal energy industry to facilitate the implementation of the new geothermal exploration legislation.

Western Australia

In this state, there is a Sustainable Energy Development Office¹⁰ which is responsible for funding, administering projects, support and development of renewable energy. This includes nine separate programs. Western Australia is currently preparing specific legislation to facilitate the extraction of geothermal energy.

Tasmania

Tasmania is a historical accident when it comes to renewable energy. Rich in high rainfall and with a number of significant elevated ranges and plateaus, but lacking in coal, its electricity needs have been met primarily by hydro power. This has brought it into conflict with conservationists on many occasions and resulted in significant disputes, including a major High Court case in 1983 after the Labor Federal Government blocked the Gordon Below Franklin dam project.

The focus on building dams has meant that over 90% of Tasmania's electricity is generated from renewable sources. Hydro has been the predominant source of electricity since the first power stations were built in the early 1900's. To date, there are 29 hydro-electricity power plants in seven different catchment areas through out Tasmania.

These catchment areas are:

- Great Lake - South Esk;
- Derwent;
- Mersey Forth;
- Gordon - Pedder;
- Pieman - Anthony;
- King; and
- Yolande

The Derwent is the largest catchment with over 25% of the State's average output coming from its ten power stations. The State's hydro-electric resources are managed by Hydro Tasmania, a State-owned Company. Other than trumpeting its historical willingness to build dams in areas of outstanding natural beauty, Tasmania has no specific legislation or programs on renewable energy.

Australian Capital Territory

In the ACT, there is a reciprocal legislative regime to the NSW GGAS scheme enabling the extension of that scheme in the ACT. The ACT has also announced it will introduce

¹⁰ See <http://www1.sedo.energy.wa.gov.au/>

legislation that mirrors the NSW renewable energy legislation to set targets for the production and consumption of renewable energy.¹¹

4. **Future prospects for renewable energy**

Despite the reforms noted above, there remain a range of barriers to a greater uptake of renewable energy. In the author's view, the following are some of the key measures required to improve the uptake of renewable technologies:

- clear medium and long term targets for reducing greenhouse gas emissions
- introducing a national measure to price carbon emissions
- setting meaningful renewable energy targets on a national and State based level
- removal of legal and policy barriers
- maximising energy efficiency and energy demand management
- long term funding of research and development.

Each of these is discussed below.

Setting targets to reduce greenhouse gas emissions

The Federal Government has been loath to adopt greenhouse gas reduction targets. This in large part appears to stem from a view that Australia should not commit to reductions until the world's major emitters similarly do so and that targets can harm the economy. This has been a consistent theme from the current conservative government for over a decade, despite warnings that delayed action is more costly than taking action.

Despite the inertia at the Federal level, a number of the State and Territories have announced targets, including NSW and South Australia. These are:

NSW - reducing to 2000 levels by 2025 and to 60% of 2000 levels by 2050;

South Australia - reducing emissions to 60% of 1990 levels by 2050.

ACT - to 2000 levels by 2025 long term and to 60% of 2000 levels by 2050.

Carbon Pricing

As externalities plague electricity pricing producing distorted demand for fossil fuel generated electricity. Cheap electricity is seen as a key competitive advantage. Yet that advantage produces a disproportionately high level of greenhouse gas emissions.

Until there is a price put on carbon emissions, renewable energy is unlikely to provide any meaningful contribution to the deed cuts necessary to avoid the predicted severe impacts from climate change.

The recently released Stern Report¹² refers to research which shows that, if carbon was properly priced, the economic viability of renewable energy would approach or be better

¹¹ See Speech by Hon Jon Stanthorpe, - *Weathering the Change* - 27 July 2007.

than that of coal fired generation of electricity.¹³ In addition, other research supporting this report shows that, over time, it is probable that the cost of generation capacity from wind farms, even without additional carbon emission pricing, will approach (and, indeed, may become less than) the cost of coal fired generation.¹⁴

Thus pricing remains a key constraint. As direct regulation of emissions is too difficult, costly and economically inefficient, the two economic instruments available are carbon taxes and tradeable permits. Carbon taxes are theoretically easier to administer but have significant problems when it comes to setting a level playing field internationally, as noted in the Stern Report:

However, the international harmonisation of carbon taxes can be extremely difficult in practice. At a European level countries have previously failed to agree on a common carbon tax. Even the relatively homogenous group of four Scandinavian countries that sought to implement a uniform tax from the early 1990s ended up with a complex patchwork of partial application and exemptions between and within the countries. Seeking an internationally uniform tax would preclude national discretion about ways of implementing environmental goals; and this may conflict with national sovereignty and the practical politics of domestic policy formation.¹⁵

not favoured in Australia (for reasons relating more to ideology than economics) and thus tradeable permits have been closely examined. Significant changes in policy have emerged in the last 12-18 months and now it is almost certain that Australia will adopt a national emissions trading scheme.

While some State-based regimes have been in place for a few years, the development of carbon trading has been slow largely because of the restricted market. With leadership from NSW, the States and Territories developed a major discussion paper of a national emissions trading scheme in August 2006.

Following widespread support for the concept, particularly from industry, the Federal Government announced a major task force to investigate the feasibility of a trading scheme. Following the support of the task force, the Government has announced that it intends to implement a national emission trading scheme by 2012. The Labor Opposition has announced a similar scheme commencing in 2010. Once a national scheme is designed and implemented, a number of the state based schemes are expected to be discontinued. A price for the emission of greenhouse gases across the nation, with a substantial national trading market will provide an ongoing incentive for renewable energy - provided the scheme is not designed to favour established generators through the grandfathering of permits.

A table outlining the features of the various schemes that have been proposed is set out below.

Key features	Government	Labor	States & Territories Proposal	Prime Minister's Task force
Institutional	National	National	Prefer national	National - only one

¹² Stern Review on the Economics of Climate Change, HM Treasury, London, 2006

¹³ *Aligning Climate and Energy Policy: Creating incentives to invest in low carbon technologies in the context of linked markets for fossil fuel, electricity and carbon* Report prepared by William Blyth and Kirsty Hamilton, April 2006 - particularly 1.1 and Figure 2.

¹⁴ Dennis Anderson, (2006) *Costs and Finance of Abating Carbon Emissions in the Energy Sector*, Table 1.1, Figures 2.2a, 2.2c, Table 3.1 and Annex 3

¹⁵ Stern Review on the Economics of Climate Change, HM Treasury, London, 2006 , p 470.

Key features	Government	Labor	States & Territories Proposal	Prime Minister's Task force
structure?			scheme but would try to set up state schemes if necessary.	scheme
What is the cap/target?	Target to be assessed with detailed economic modelling and set in 2008	60% reduction by 2050 Short to medium term target to be set post economic modelling of Garnaut Review completed in 2008	60% reduction by 2050 Firm cap set for the first ten years of the scheme Then "gateway" cap or range set for the next ten years of the scheme (with these to be updated every five years)	Set a long term goal. An emissions reduction trajectory that commences moderately, progressively stabilises and then results in deeper emissions reductions over time Sufficiently flexible that can: - Be periodically recalibrated - forward carbon price path
What industries will be covered?	Unclear	Unclear	Initially electricity generators with a capacity of over 30 MWe. Possibly extend to other sectors at the end of the first five years - eg gas pipelines, coal and oil	Maximum practical coverage Initial exclusion of agriculture and land use
Start date?	No later than 2012	No later than 2010 - detailed design finalised by end of 2008	Could commence as early as 2010	2008 - set long term goal 2009 - emissions and reporting system established 2010 - finalise key design features and establish legislative basis for scheme 2011/12 - establish first set of short-term caps and allocate permits 2012 - commence trading
Which gases?	No clear indication at this	No clear indication at	All six from the Kyoto protocol -	All greenhouse gases

Key features	Government	Labor	States & Territories Proposal	Prime Minister's Task force
	stage.	this stage.	carbon dioxide, methane, nitrous oxide, sulphur hexafluoride, perfluorocarbons and hydrofluorocarbons	
Link to international scheme?	No clear indication at this stage.	Yes. Aims to set up a structure to make this possible	Should have option to link where possible although main purpose should be to establish a strong domestic market. Should be able to link with Clean Development Mechanism to allow cross-recognition of offsets and prevent double counting	Capacity to link to other national and regional schemes
Manner of permit distribution?	No clear indication at this stage.	No clear indication at this stage.	Each permit allows 1 tonne of Co2-equivalent and is date stamped with the year in which it first became valid. Some allocated free first to existing generators significantly adversely affected by the scheme. Some allocated for free to firms in trade-exposed, energy-intensive industries (both existing and new) Remainder auctioned.	Mixture of free allocation and auctioning of single-year dated emissions permits: - up front once and for all free allocation of permits as compensation to existing businesses - periodic auctioning of remaining permits
Offsets?	No clear indication at this stage.	Yes, national standard for carbon offsets to be set up to	Yes, consistent with international schemes	Recognise wide range of credible carbon offset schemes

Key features	Government	Labor	States & Territories Proposal	Prime Minister's Task force
		ensure consistency including: <ul style="list-style-type: none"> - minimise duplicity - national consistency - minimum standards for offsets - credits to be cancelled once used - all products on market accredited - verification and validation 	Include initially: <ul style="list-style-type: none"> - forest projects - carbon capture and storage - Industrial process emission reductions (at some point in the future) - projects relating to collection and combustion of methane from landfills and waste water treatment facilities 	
What about abatement between now and start date?	Mechanisms to prevent scheme detailing abatement now.	No clear indication at this stage.	Discourage continued emissions through "updating mechanism" or "use it or lose it" rule	Incentive for undertaking abatement measures in the lead up to the scheme

With a forthcoming Federal election likely in November 2007, the final form of a national trading scheme is yet to be determined. Thus some uncertainty over the rules and arrangements is currently hampering investment in renewables. While a national trading scheme should ultimately make renewable energy more attractive for investment competitive, the expansion of the MRET scheme and the establishment of a key target for renewables would provide an additional incentive, particularly until a national scheme is fully operational.

Renewable energy targets

The Commonwealth MRET scheme initially set a relatively modest target which was easily achieved. The lack of a more ambitious target is likely to result in decline in investment in those areas which are not supported by other policy regimes. This is disappointing in that the MRET scheme initially gave much impetus to the development of the renewable energy sector.

Fortunately, as noted above, a number of States have developed clear targets for the utilisation of renewable energy. These include:

Victoria - 10% by 2016;

NSW - 10% by 2010 and 15% by 2020 and keeping that level until 2030.

Queensland - 10% by 2020;

Western Australia - 15% of the South West electricity grid by 2020.

South Australia - 20% by 2014.

Removing legal and policy barriers

A number of significant barriers exist that hamper the development of renewable energy. One major issue in a number of jurisdictions is government approval processes. At the local level, planning schemes often pose a substantial disincentive. For example, if a household wants to install a solar hot water system, in many jurisdictions, a council consent is required. These often take considerable time and impose additional costs which are not recoverable. In many areas of the cities, there are in fact planning law rules that prejudice solar hot water. For example, in the North Sydney local government area, the relevant planning scheme, the North Sydney Local Environment Plan provides that to install a solar hot water systems requires consent from the council in situations where the system is visible from the street, a foreshore or a reserve. On one view, this is absurd for solar hot water systems should be clearly visible to encourage others to install such systems. Requiring consent requires another fee, adds considerable time and is likely to add significant cost if consent conditions impose additional requirements.

Approvals for certain wind projects can take considerable time and cost. These projects are usually located in windy rural areas and can generate considerable opposition within the local community. Recognising this, the Federal Government recently released consultation guidelines for major wind projects.

Because wind farms need large areas they are also typically found in remote rural locations, which are also often the location of significant conservation areas. Such areas often have major populations of native fauna and bird species that can be affected by turbines. This together with visual amenity impacts has given rise to considerable planning disputes.

An example of such a project is the project by RES Southern Cross who lodged a proposal with the NSW Minister for Planning for a wind energy project in rural NSW (Upper Lachlan Shire). The project involved 62 wind turbines mostly located on private land but some on Crown land (land owned by the State of NSW). Projects of this size in NSW are approved by the NSW Minister for Planning rather than at the local council level. This project was approved with detailed conditions of consent on 17 January 2006. Local objectors took legal action challenging the merits of the approval in the NSW Land and Environment Court.¹⁶

While the merits review did not result in the refusal of the project, it did result in a number of additional conditions of consent. In total the approval listed 116 conditions of consent. These include:

- Provisions obliging the proponent to acquire certain identified properties when requested by the landowner and the payment of compensation;
- Environmental impact reports during construction and operation;
- A complaints management system

¹⁶ Merits review by third party objectors for the category of "designated development" is permitted under section 98 of the *Environmental Planning and Assessment Act 1979* (NSW).

- Detailed management plans to deal with landscaping, fauna and flora impacts, noise impacts and other construction issues.

Other barriers also exist. There are split incentives in some sectors, such as those that apply to landlords and tenants. In major commercial buildings the splitting of incentive can result in the low uptake of renewable energy and energy efficiency measures.

Maximising energy efficiency and funding of research and development

With the exception of Tasmania, almost all of the States and Territories have instituted policies and programs supporting renewable energy as part of a suite of measures to address climate change. The policies and programs vary considerably and include various forms of rebates to support the consumption of electricity from renewable energy sources, education and support programs and funding. Ideally these arrangement ought to be vested under the control of a separate agency with its own secure funding and resourcing. Such agencies should be given commercial incentives to increase the awareness and use of renewable energy and be allowed to partner the private sector in R&D and other projects.

At present, the principle problem is a lack of commitment on part of the Federal Government to increasing the target for the MRET scheme. The modest initial target has already been met and the investment is feared to fall away. It is possible with a change in Government that a renewed focus will emerge.

Conclusion

Despite fierce opposition from the fossil fuel industry, renewable technologies are emerging into the clean air. To varying degrees, State and Territory governments are active supporters of the sector with some instituting innovative laws, policies and programs. With the new commitment to a national emissions trading scheme within 3-5 years, it is likely that the sector will continue to grow and its prospects are relatively bright. More work needs to be done to facilitate investment including removal of legal barriers. Whether it will achieve levels of electricity production evident in some other countries in spite of the plentiful and cheap cost of coal and gas, remains to be seen.
