Wind Power Policy in Australia: An Uncertain Future

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Abstract

This paper draws on research analysing the forces shaping the deployment of wind power in Australia. It draws mainly on a contextual historical approach to explain the fortunes of wind power. It demonstrates how a small opening for wind power is exposing a range of institutional barriers, and analyses attempts by wind power proponents to bring about institutional change.

With its vast supplies of fossil fuels, Australia has long relied on cheap energy supplies to attract energy-intensive industries. Despite Australia's very high *per capita* greenhouse emissions, the government is following the USA in refusing to ratify the Kyoto Protocol. Nevertheless, the Australian government has developed greenhouse policies for the energy sector. Although the main focus has been on reducing emissions from coal, mechanisms have been introduced to support the introduction of renewable energy. The main mechanism is the Mandatory Renewable Energy Target (MRET), which should lead to an additional 9500 GWh of renewable energy per year by 2010. The MRET has led to many wind farms being planned.

While MRET has created a market for wind power, it is small and short-term. Because the government has refused to expand the target, the wind industry is taking a cautious approach to investment. There have been some changes to supporting institutions such as in planning and noise standards; however, these fall under the jurisdiction of state governments. Responses have been mixed. Communities affected by wind farm proposals are also becoming more hostile, and planning policies are failing to facilitate a compromise. The electricity industry, which in the past has rejected wind power due to its cost and intermittency, has started to consider how it can integrate wind power. Its response, however, has been cautious and conservative.

Introduction

Worldwide, the quest to radically reduce greenhouse gas emissions from electricity generation presents an enormous challenge. In Australia the task seems quite intractable. Australia has vast fossil fuel resources, and has long relied on cheap electricity to attract energy-intensive industries. The principal focus of Australia's energy policy over the past three decades has been maintaining Australia's competitive advantage in the energy and minerals sector by providing a favourable investment climate for industry. This has meant keeping energy prices as low as possible.

Low energy prices and inadequate regulations governing energy efficiency have given Australian electricity consumers little incentive to reduce demand; indeed, electricity demand is forecast to grow by 56% in the period 2003–2020.[1] About three-quarters of Australia's electricity is generated from coal—including nearly one quarter from highly emissions-intensive brown coal. Australia's *per capita* greenhouse gas emissions are among the highest in the industrialised world. At the 1997 Kyoto climate change conference, Australia successful negotiated an 8% increase in emissions, and yet is following the USA in refusing to ratify the Kyoto Protocol. Nevertheless, the government claims to be on track to meeting the Kyoto target, because Australia's large increase in energy emissions should be in part offset by emission reductions from forestry sinks and land use changes.

The Australian federal government has recently introduced some modest greenhouse policies for the electricity sector. Some of these policies are aimed at fostering greater use of renewable energy generators. For a long time, renewable energy was regarded as suitable only in remote areas, where it could displace expensive liquid fuels—parts of Australia are sparsely populated, so there are many communities which rely on remote area power supplies (RAPS). Consequently, Australia has developed significant expertise in the development of renewable energy RAPS systems. Only since 1997 have two mechanisms been introduced that support the deployment of renewable energy in the grid areas, where it can displace electricity generated from fossil fuels.

This paper is concerned with how wind power is faring in Australia under these two mechanisms. Wind power is one of the most mature and cost-effective of the new renewable energy technologies, and worldwide, it is one of the fastest growing energy technologies. In Australia, the use of wind power is increasing rapidly, from about 11 MW installed capacity in 1999 to about 200 MW in 2003. Thousands of megawatts of capacity have been proposed.[2]

The starting point for this analysis of the fortunes of wind power in Australia is that new technologies are usually required to fit into an existing socio-technical system, with which they may be, to varying degrees, incompatible. For example, wind power's intermittency and diffuseness mean that it is regarded as a nuisance by many in the electricity industry, and it does not fit with existing planning practices. Thus the proponents of a new technology require a protected space where they can learn more about how the new technology can be made to fit into the existing socio-technical system, or rather, how the existing system and the new technology can be mutually reshaped to enable a better fit. I regard the existing two renewable energy support mechanisms as providing a protected space where such learning can take place.[3]

I start by describing the two renewable energy support mechanisms and their impact on wind power. I then describe and assess attempts to create a better fit between wind power and the structures and practices of the existing electricity system. This effort to create a better fit is slowly leading to policy change in supporting institutions. However, the momentum for policy change may be declining as the future of the main support mechanism has been thrown into doubt.

Mechanisms Supporting Grid-Connected Wind Power

The first mechanism to stimulate grid-connected renewable energy in Australia was Green Power. These are voluntary schemes offered by electricity retailers, whereby customers pay a premium on their power bill for an equivalent amount of electricity to be sourced from renewables (over and above the mandatory requirement, described below). Similar schemes are now offered in many countries. In Australia, they were first offered by retailers throughout the state of New South Wales, triggered by the development of green power accreditation guidelines by a state agency; later such products became available to most electricity consumers throughout Australia. However, because Green Power is voluntary, the take-up is very low: at 500 GWh/year it represents approximately 0.3% of electricity sales. The second mechanism is the Mandatory Renewable Energy Target (MRET). As part of its negotiating position at the Kyoto climate change conference, the federal government promised that, by 2010, electricity retailers would be required to source an additional 2% of electricity from renewable energy. The target was introduced in 2001 and fixed at 9500 GWh per annum by 2010, a figure which according to more recent electricity forecasts represents much less than a 2% increase, perhaps even a 0% increase, since the existing contribution from renewable energy (i.e. old hydro) was already 10.5%.[4] The interim target for 2004 is 2600 GWh. The measure includes a $40/MWh (4c/kWh) penalty cap; but it applies only until 2020.

While MRET is stimulating much more renewable energy than is Green Power, the two mechanisms differ significantly in their definition of eligible renewable energy generators, and thus their effects on wind power are quite different.

Green Power schemes are voluntary; thus a key consideration is what the public regard as environmentally acceptable forms of renewable energy. Most Green Power is accredited under a national program which specifies what forms of renewable energy are admissible. Specific exclusions include incineration of municipal waste, flooding hydro plant, and wood waste from old-growth forests. Moreover, 80% of Green Power must come from new (post 1997) generators, a figure which may soon rise to 100%. Thus Green Power's strict definition of renewable energy

benefits wind power because there is less competition—currently wind power contributes about 33% of Green Power sales.[5]

MRET, on the other hand, is mandatory; thus its introduction was opposed by a range of business interests concerned about its effect on electricity prices. Consequently, the final form of the measure was quite generous in terms of its definition of renewable energy. Although it was intended to encourage new renewable energy generators, MRET admits the output of existing renewable energy plant in excess of a specified baseline, thereby favouring old hydro plant. Controversial renewable energy sources—new flooding hydro plant, municipal solid waste incineration and wood waste from old-growth forests—are also eligible. And despite MRET being directed at electricity generation, it includes solar hot water heaters for the amount of electricity they would displace. In 2003, about 70% of the Renewable Energy Certificates registered under MRET were for solar hot water and existing hydro, although the proportion from existing hydro should decline as the target ramps up. In 2003, wind power generators registered only 10% of the total Certificates;[6] however, the wind industry expects to contribute 26% of the MRET by 2010.[7]

Prior to the introduction of these mechanisms, the Australian wind energy industry was extremely small—it comprised mainly a few firms involved with small wind systems for remote areas. In the past five years, the wind energy industry has burgeoned. Representatives from European wind turbine manufacturers and wind farm developers have established offices in Australia, and many local businesses with no prior experience in wind have moved into the industry. An Australian Wind Energy Association (AusWEA) was established in 1999, and has become a significant lobby for the industry.

The establishment of a market for wind power has led to proposals for many wind farms projects—far in excess of that needed to supply wind's expected contribution to MRET and Green Power. Much of AusWEA's recent lobbying efforts have been directed at increasing the size of the market. Along with many other renewable energy and environment groups,[8] AusWEA have called for MRET to be increased to a 10% target for additional renewables capacity by 2010, the measure to be extended well beyond 2020, and the penalty cap increased.[9] AusWEA have argued that, without an increase in the target, much of the planned investment from the many thousands of megawatts of wind farm proposals would be lost. Moreover, they regard the short timescale of the measure as a deterrent to investment, as it gives investors insufficient confidence in the market. Not extending MRET, AusWEA claims, will lead to a boom-bust market. AusWEA have also been pushing for the development of local manufacturing facilities, which they claim will provide jobs in rural and regional areas. They argue that an increase in MRET is necessary to ensure a competitive industry.

AusWEA's hopes of an increase in the MRET have been thwarted. In mid 2004, the federal government released its energy policy statement, in which it stated that there would no increase in the MRET level.[10] The federal government signaled a shift from away from supporting the renewable energy industry towards providing demonstration funding for large-scale technologies which could deliver sizeable reductions in greenhouse gas emissions. It was widely reported that the main technology benefiting from this funding would be geosequestration—a technology intended to capture the carbon dioxide emissions from coal combustion and store them underground. In other words, the funding was aimed at making the coal industry more viable in the longer term.

For a time, the wind industry pinned their hopes on a change of government—in the lead-up to the recent federal election, the Opposition promised to increase MRET to 5%, and to ratify the Kyoto Protocol. However, in the October 2004 election, the government was returned with an increased majority. The wind power industry is now hoping for greater support from the state governments. In the past, cooperation between the states on energy matters has been difficult—typically, inter-state rivalry was the norm. Moreover, the electricity market is now, in effect, a national one, covering

about 90% of the population. However, all of the six states and two territories in Australian have Labor governments, whereas a conservative coalition is in power at the federal level, possibly increasing the likelihood of inter-state cooperation. The state energy ministers have now agreed to work together to increase the target for renewable energy. At the time of writing, the state governments have not yet reported on how this might be achieved.

Although MRET will stay in place until 2020 (at a constant target from 2010-2020), investment in new wind farms may soon stagnate. AusWEA have claimed that without an increase in MRET, there will be essentially no more investment in wind power after 2007.[11] Without the state governments' proposed target, the only mechanism which might stimulate growth in grid-connected wind power is Green Power.

Green Power schemes are offered by electricity retailers; but the state governments facilitate the program through membership in the National Green Power Accreditation Steering Group. Green Power sales were quite stagnant for a time, but are now growing at a rate of about 40% per annum.[12] Of course, this growth is from a very small base—only about 1% of electricity consumers purchase Green Power, and many purchase only a proportion of their consumption as Green Power.

It remains to be seen whether the federal government's refusal to increase MRET will lead to more electricity consumers purchasing Green Power as a way of maintaining some stimulus of the renewable energy industry. Perhaps because Green Power represents a much smaller market for wind power, and because it can be taken as a given, the wind industry seems to have shown little interest in developing this market further.

From the above brief account, it is clear that policies for stimulating wind power face an uncertain future. Yet, these policies provide only a means by which the generation costs of wind power can become more competitive with that of traditional energy sources. Although wind power is considered one of the cheapest forms of renewable energy, there are a range of other institutional barriers to its greater deployment. Because of MRET, a wind industry has been established, and it has been very motivated to lobby for changes in a range of policies to address these institutional barriers. I now turn to reviewing efforts to remove these other barriers.

Planning and Community Conflict

Wind turbines require strong winds unimpeded by nearby obstacles. Tall buildings and trees create turbulence and slow down the wind; therefore wind farms are usually located in agricultural areas, particularly in fields used for grazing. The strongest winds are usually found in coastal and elevated areas, many of which are very scenic. Unlike other power plants, wind farms occupy vast areas of land—turbines are typically about half a kilometre apart—yet their total footprint is very small. Moreover, wind turbines are typically about 100 metres tall and may be visible from a distance of over ten kilometres. And although modern wind turbines are much quieter than in the past, at night-time within certain wind speeds and in particular terrains, the noise from wind turbines can be higher than the background noise found in many rural areas.

For these reasons, wind farms present a challenge to traditional planning practices. Many local communities are concerned about the effect of proposed wind farms on their visual amenity. Other concerns include noise and bird strike, particularly of endangered species. Farmers who lease their land for wind turbines are paid a substantial rent for each turbine, while their neighbours, who may be affected by noise or loss of visual amenity, receive no benefit. It is hardly surprising that wind farms can cause conflict within some communities. In parts of Europe, offshore wind farms are proving to be a less controversial alternative—although they have a much higher capital cost, the

wind resource is much better. However, it is unlikely that offshore wind farms will be proposed for Australia in the medium-term, as Australia has no shortage of land.

Local opponents of wind farms aim to stop developers gaining planning approval. In Australia, planning decisions are usually the responsibility of local councils, with statutory guidance provided by state governments. Local councils are subject to political pressure from local businesses—which apart from eco-tourism operators are typically in favour of wind developments—and from local opponents. Some local councils have been very favourably disposed towards wind farms; others have not.

Attempts to address planning obstacles to wind farms vary in each state. Here I briefly review what has occurred in the state of Victoria. Victoria has an excellent wind resource, and many wind farms have been proposed for coastal areas in the state, often in particularly scenic areas. A few inland wind farms have also been proposed. The Victorian Labor Government (which came to power in 1999) is a strong supporter of wind power, and has set what is arguably a very ambitious target—1000 MW of wind power by the year 2006. (Current wind capacity in Victoria is 92 MW, with a further 195 MW under tender.[13])

Victoria was home to the first major conflict over a wind farm proposal. In 1997, the Energy Equity Corporation lodged a planning application to build a 25 MW wind farm at Cape Bridgewater, near Portland on Victoria's western coast. Cape Bridgewater was widely acknowledged as having exceptional landscape qualities including some of the highest cliffs in the state. It also formed part of the Great South West Walk, an eco-tourist destination. The project was approved by the local council, but a number of local opponents appealed to the Victorian Civil and Administrative Tribunal (VCAT). VCAT were aware that by permitting a wind farm in a renowned coastal landscape, they would be setting a precedent. The previous state government had no interest in supporting renewable energy, and offered no guidance to VCAT. In early 1999, VCAT upheld the appeal, principally on the grounds of the visual impact.[14]

In 2000, plans for a 140 MW (later 195 MW) wind farm at Cape Bridgewater and several nearby sites were taken up by the company Pacific Hydro Limited (PHL). The project was dubbed the Portland Wind Energy Project (PWEP). PHL was also negotiating with a wind turbine manufacturer to establish a manufacturing facility in Portland (later only manufacture of blades). PHL believed that the climate was now more favourable for wind power: the federal government was introducing the MRET; the new Victorian government was enthusiastic about wind power developments; the local council was developing a wind power strategy, and the promise of manufacturing jobs was very attractive to a community with relatively high unemployment.[15] The government appointed a planning panel to recommend on the PWEP. In the meantime, two other much smaller wind farms were being built in Victoria, at sites not as controversial as Cape Bridgewater.

In August 2002, the Victorian government announced that it would approve PWEP, subject to certain conditions, because it believed that the benefits of the project, including its substantial contribution to renewable energy supply and the economic boost to the region, far outweighed the disbenefits. To date, the PWEP has not yet been constructed, seemingly because of delays in establishing the blade manufacturing facility, but work is intended to commence soon. Meanwhile PHL has built another far less controversial 52.5 MW wind farm in inland Victoria.

At the same time as it approved the PWEP, the government released its wind energy policy and planning guidelines. These guidelines made the Planning Minister the responsible authority for wind projects greater that 30 MW, in effect removing local councils from decision making. They also stated that the only areas specifically excluded from wind farm development are those reserved under the National Parks Act (1975)—about 43% of Victoria's coastline, and 32% of areas within

one kilometre of the coast—with other areas subject to approval by the Minister.[16] This exclusion, however, would make little difference—it was already very unlikely that a wind farm would be approved for these reserved areas. Moreover, many of the reserved coastal areas are only narrow strips, and many are in the far east of Victoria, where the winds are poor. While the guidelines state that the visual impact of a wind farm will be considered in decision-making, they state: "Consideration of the visual impact of a proposal should be weighted having regard to the Government's Policy in support of renewable energy development."[17]

The Victorian wind energy policy and planning guidelines provide only a framework for decision-making about individual wind farm proposals from (mainly) private developers. They do not lay out a plan for how wind capacity should be developed as a whole throughout the state. Indeed, since Victoria's electricity system was privatised in the 1990s, the state government has not been involved in electricity generation or overall planning of the electricity system. An overall plan for location of wind farms could help to maximise the social and environmental benefits of wind power. Moreover, wind capacity could be planned in such a way as to minimise any problems with the electricity system, through both planning wind capacity around the capabilities of electrical networks and planning dispersed wind farms to reduce the effect of intermittency on system operation. However, the ad-hoc approach of the market does nothing to further such aims.

The Victorian guidelines were intended to make it easier for wind farm developers to gain planning approval. However, they seem to have exacerbated the conflict over wind farms. Throughout Victoria, a number of anti-wind farm groups are now fighting against wind farm proposals in their local area. These opponents argue that the guidelines have taken away the democratic rights of local communities.[18] Opponents claim that wind farm proposals are splitting small communities. Anti-wind farms signs are displayed in many properties surrounding wind farms proposals. In the main, the wind industry also does not believe that the guidelines are adequate. Some developers are now calling for a clear zoning scheme of "no go", "as of right" and permit-controlled zones.[19] Some developers are pursuing wind farms in inland Victoria, where the winds may not blow so strongly but the opposition is less intense. And of course while some developers are interested in the long-term sustainability of the wind industry, others are only in it to take advantage of the short-term business opportunities. Thus there have been reports of wind farm developers engaging in unethical practices, which seem to be exacerbating community conflict.[20]

The Australian Wind Energy Association is taking a leading role in finding a better way to resolve the siting dilemma. It has now joined with the Australian Council of National Trusts to establish methodologies for assessing landscape values. At this stage only an Issues Paper has been released.

Integrating Wind Power into the Electricity Grid

Unlike most conventional energy sources, which are predictable, controllable and centralised, wind power is intermittent, relatively unpredictable and diffuse. Electricity supply and use patterns, and practices in the electricity industry have evolved around the characteristics of conventional energy sources, and thus are somewhat incompatible with the characteristics of wind power.

In Australia, along with many other countries, the electricity industry underwent significant restructuring during the 1990s. This included the disaggregation, and in some cases privatisation, of the former state-owned, state-based electricity commissions, and the introduction of competition in generation and supply within a national electricity market. Restructuring was also intended to allow private generators open access to the electricity grid. In practice, the restructuring process was dominated by existing players—who had the expertise—and thus the electricity system still operates in a way which favours existing large generators. Although the National Electricity Code includes what is known as the principle of technological neutrality, viz: "[A] particular energy

source or technology should not be treated more favourably or less favourably than another energy source or technology",[21] the rules of the market and the operating standards are built around the characteristics of traditional generators. These act as barriers to wind power.

The creation of a market for wind power has meant that wind farm developers are starting to come up against these barriers and are pushing for change. Electricity system and network operators are also anticipating a large influx of wind power and are investigating how wind can be integrated. However, the electricity industry is cautious and conservative; thus change is slow. Of course there are also neoliberal commentators and representatives of energy-intensive industries who are trying to stop market rules being changed to make it easier for wind to enter the market.[22] Here I briefly review some of the changes underway.

The most immediate concern of wind farm developers is connecting to the network, and to do this, they need a connection agreement with network service provider (NSP). Negotiating such agreements has been a problematic area, particularly in the determination of the costs and benefits of the new generator to the NSP. Small generators are at a disadvantage due to their lack of information compared with the larger NSPs. However, this problem is shared by many other types of new generators, and so there has been much attention given to tackling this barrier.[23]

Proposed wind farms often have an additional problem when connecting to the grid: their siting requirements means that they may require substantial new grid infrastructure. The power output of a wind turbine is roughly proportional to the cube of the wind speed (at medium wind speeds); thus it is important to find sites with high wind speeds. However, the local grid infrastructure or interconnectors to other regions may be inadequate. Currently, wind farm developers need to bear the cost of any required augmentation to the electricity network; but this can add a substantial additional cost to the project. The situation is exacerbated in Australia because the low population density and huge area means that there are many long power lines of low capacity. Wind farm proposals in the state of South Australia (SA) are most affected by this problem. SA has some of the best winds in Australia; indeed, two-thirds of Australia's wind farm proposals are for SA,[24] many of them in areas with weak grids. Moreover, the state has a low minimum load; thus if there were sizeable wind capacity built in SA, power would at times need to be exported to other states. However, the existing interconnectors are of low capacity—indeed, the main interconnector was designed for SA to import rather than export electricity.

The costs for wind farms connecting to the electricity network exhibit significant economies of scale. So, for example, parts of SA have sufficient land and wind resource for a large number of wind farms, but the grid infrastructure would require a substantial upgrade. The Eyre Peninsula is a case in point: it is sparsely populated and about 600 km to the major load centre of Adelaide. Wind farm developers could reduce their network connection costs through a cooperative arrangement, but that seems unlikely in a highly competitive environment, where confidentiality is a key issue. Alternatively, such a network could be declared a regulated asset, with the costs therefore spread across all users. At the present time, such networks do not meet the 'regulatory test' specified in the National Electricity Code.

The state of Victoria has been the first to address this issue. In November 2004, the Victorian Government passed legislation that allows for a Ministerial intervention to require wind farm connection costs to be shared across all users of the system, rather than just the wind farm developer.[25] This should significantly reduce the cost of some wind farm projects. At this stage it remains to be seen if other states will follow suit. Victoria is by far the most densely populated of the states, and typical distances from windy sites to major transmission lines are relatively short. Thus the costs associated with such a decision are not as high as those likely in other states.

While wind farm developers focus on their immediate concerns such as grid-connection, the electricity system operator has a more long-term concern: What will be the effect of a high wind penetration on the operation of the electricity system? At the present time, the penetration of wind power is too low to make a difference to the overall system—currently any effect that a wind farm has on the electricity system is only local; however, if the forecast growth in wind capacity is achieved, wind could have a significant detrimental effect on overall system operation. Wind power is classified as an intermittent energy source, because wind speeds and hence the power output of a wind turbine are fluctuating, and are at a given instant unpredictable. In an electricity system with no storage capacity, demand and supply are matched at every instant. The system operator forecasts electricity demand and dispatches sufficient generation to meet this; however, there will usually be some discrepancy. Thus 'ancillary services' are also dispatched to maintain the demand–supply balance: that is, some generators agree to continually raise or lower their output. There is concern that a high penetration of wind power will exacerbate the requirement for these ancillary services, thereby raising the cost.

The degree to which wind power will affect the requirement for ancillary services is not well understood. At this stage the question of how to allocate any additional costs of ancillary services has not been addressed, because the penetration of wind power is still low. This is of course an issue being faced in other countries where the penetration of wind power is also increasing. However, not all overseas experiences can be directly transferred to the Australian situation. For example, compared with the strongly interconnected electricity systems of North America and Europe, Australia's electricity system is quite small and most interconnectors between regions are relatively weak. This is in part due to Australia's large area and low population density. The total output of wind power within an interconnected grid is also smoothed to some extent because different regions face different wind conditions. The degree to which such smoothing occurs will be different in Australia to other countries.

In Australia (and elsewhere), there is now an increasing expectation on wind farm operators to forecast their power output. Thus techniques for forecasting the wind speed, and thus the wind power output are being developed. The federal government has recently announced funding for the development of systems which can provide accurate long-term wind forecasts. The electricity system operator has recently proposed changes to the National Electricity Code to require large wind farms to provide real-time operational data and to submit forecasts of their output for time periods greater than six hours ahead. (The persistence methodology would be used for periods less than six hours.) At this stage, the recommended code changes have been rejected, because they are not taking into consideration developments in forecasting methods being pushed by the federal government.[26]

Conclusion

MRET, and to a lesser extent Green Power, have exposed a range of institutional barriers to wind power, and are providing a space where proponents of wind power can learn more about these barriers and how to overcome them. There has been some policy change attempting to address these wider barriers; however, progress is slow and, indeed, may be slowed further because of the federal government's decision to turn away from supporting renewable energy. Most policy change is reactive, that is, it is directed at removing the immediate barriers to wind power. Change is also constrained by the structure and practices of the existing electricity system. Yet the effect of these changes has been mixed, and many problems have not been successfully resolved.

Endnotes

[1] Energy Supply Association of Australia, *Future Demand*, 2003, <http://www.esaa.com.au>
[2] Australian Wind Energy Association, *Wind Energy Projects in Australia*, 2004, <http://www.auswea.com.au>
[3] René Kemp, Arie Rip and Johan Schot, "Constructing transition paths through the management of niches", in Raghu Garud and Peter Karnøe (eds), *Path Dependence and Creation*, Lawrence Erlbaum Associates, Mahwah (New Jersey), 2000.
[4] Business Council for Sustainable Energy, *BCSE Submission to the MRET Review*, 2003, <http://www.bcse.org.au>
[5] National Green Power Accreditation Program, *Quarterly Status Report: 1 July – 30 September 2004*, <http://www.greenpower.com.au>
[6] Registry for Renewable Energy Certificates, http://www.rec-registry.com
[7] Australian Wind Energy Association, *Submission to Mandatory Renewable Energy Target Review*, 2003, <http://www.auswea.com.au>. This figure is based on earlier modeling by the Australian Bureau of Agricultural and Resource Economics.
[8] Greenpeace Australia, *Renewables on Target: Summary of Submissions to the Federal Government's Review of the Mandatory Renewable Energy Target*, 2003, <http://www.greenpeace.org.au>
[9] The comments here are taken from Australian Wind Energy Association, *Submission to Mandatory Renewable Energy Target Review*, 2003, <http://www.auswea.com.au>
[10] Australian Government, *Securing Australia's Future*, 2004, <http://www.pmc.gov.au/energy_future>
[11] Australian Wind Energy Association, *Wind industry welcomes renewable energy pledge*, Media Release, June 28, 2004, <http://www.auswea.com.au>.
[12] National Green Power Accreditation Program, *Quarterly Status Report: 1 July – 30 September 2004*, <http://www.greenpower.com.au>
[13] Australian Wind Energy Association, *Wind Energy Projects in Australia*, 2004, http://www.auswea.com.au
[14] Victorian Civil and Administrative Tribunal, Results *of Planning Appeal Hearing: Tribunal Application No. 1997/88762, Permit Application No. 190/97/H*, 1999, Melbourne.
[15] PHL 2002, pers. comm.
[16] Sustainable Energy Authority Victoria 2002, *Policy and Planning Guidelines for Development of Wind Energy Facilities in Victoria*
[17] *ibid*., p. 24
[18] See for example Noreen Wills, "Wind Generated Power", *National Environmental Law Association 2002 Conference*, <http://www.nela.org.au/conference/conf2002/>
[19] See for example Hydro Tasmania, *Supplementary Submission to MRET Review*, 2003, <http://www.mretreview.gov.au>
[20] John van Tiggelen, "An ill wind blowing", *Sydney Morning Herald*, September 4, 2004.
[21] National Electricity Code Administrator, *The National Electricity Market*, http://www.neca.com.au/NEM/.
[22] See for example Alan Moran (Institute of Public Affairs), *Economic and Environmental Potential of Energy Efficiency Regulations*, Submission to the Productivity Commission Inquiry into Energy Efficiency, 2004, <http://www.pc.gov.au/inquiry/energy/subs/sub006.pdf>
[23] The Business Council for Sustainable Energy (which represents renewable energy generators and cogenerators) has been most active in this regard. See Business Council for Sustainable Energy, *Guide for the Connection of Embedded Generation in the National Electricity Market*, 2003, <http://www.bcse.org.au/>
[24] Australian Wind Energy Association, *Wind Energy Projects in Australia*, 2004, <http://www.auswea.com.au >
[25] *Electricity Industry (Wind Energy Development) Act 2004* (Vic)
[26] National Electricity Code Administrator, *Intermittent generation forecasting obligations: Report*, 2004, <http://www.neca.com.au/>