Taralga Landscape Guardians Inc.

Supplementary Submission No: 116-1

27 June 2007

The Committee Secretary
House of Representatives Standing Committee
On Industry and Resources
PO Box 6021
Parliament House
Canberra ACT 2600

Dear Sir/Madam,

Inquiry into the development of Australia's non-fossil fuel energy industry: Case study into selected renewable energy sectors

Thank you for your letter of invitation of 14 May 2007 advising the Taralga Landscape Guardians of this Inquiry. Taralga Landscape Guardians welcome the opportunity to make a submission to this Inquiry. TLG have been actively involved since November 2004 in the assessment of a number of proposed wind energy facilities in the Southern Tablelands region of New South Wales and have gained valuable insights into a number of areas including:

- Landscape assessment and methodologies.
- Biodiversity impact studies and preparation of expert witness statements.
- Wind energy facility projected long term generation, greenhouse gas abatement and performance.
- Wind energy economics in terms of local job creation projections versus reality.
- Wind energy short term energy output prediction, intermittency and capacity to deliver at peak demand.
- Impact of wind energy facilities on near neighbours and other social impacts.

Members of the TLG were invited to make presentations to the former Minister for the Environment, Senator Ian Campbell, during his round table "Towards a National Code for Planning for Wind Energy Facilities", an initiative that enjoyed unqualified support from all non-state government agencies involved in wind energy.

The TLG understands that some non-government and community organisations have been offered the opportunity to make submissions to the Inquiry and we would be delighted to share our expertise face-to-face with the Committee, if this is deemed appropriate.

Yours faithfully,

Paul Miskelly
President
Taralga Landscape Guardians
[signed original sent by post]

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Dear Sir/Madam,

Inquiry into the development of Australia's non-fossil fuel energy industry: Case study into selected renewable energy sectors

Terms of reference

"The House of Representatives Standing Committee on Industry and Resources shall inquire into and report on the development of the non-fossil fuel energy industry in Australia.

The Committee shall undertake a comparative study of the following renewable energy sectors: solar, wave, tidal, geothermal, wind, bioenergy and hydrogen. The case study will examine the relative state of development of these sectors and their prospects for economically viable electricity generation, storage and transmission."

The Taralga Landscape Guardians Inc. (TLG) welcomes the invitation and the opportunity to make a submission to this very timely Inquiry.

Synopsis

As with all other forms of electricity generation technology, the various forms of non-fossil (apart from nuclear), and more commonly known as "renewable", technologies each have their own environmental impacts and planning issues. These issues should be fully and properly canvassed and understood in any proper assessment of the usefulness and economic viability of these technologies.

In the initial rush to implement these technologies, where they are new or novel to a country or society, as with the adoption of any other technology, many of these impacts and issues are often overlooked. Also, for similar reasons, it is often the case that the initial assessment does not complete a full and proper investigation of the supposed benefits, the efficiency, the net return on capital invested, of the proposed technology.

This submission endeavours to examine these perhaps unforeseen or overlooked impacts as they relate to the utilisation of wind energy, in the adoption of current wind turbine technology. The submission considers,

(a) a case study which explores the process of impact assessment of a proposed wind farm development in the vicinity of the village of Taralga, NSW,
(b) the rush by governments of all persuasions to embrace wind turbine technology, leading to inadequate assessment of the environmental impacts of proposed wind farm developments,

(c) the flawed approach by governments, and by the NSW Department of Planning in particular, which impedes any rational assessment of the supposed benefits, if indeed there are any, of current wind energy technology.

This last aspect squarely addresses the final of the terms of reference of this Inquiry:
"[to] examine the relative state of development of these sectors and their prospects for economically viable electricity generation, storage and transmission."

Case Study - Taralga Windfarm Proposal

Background

The TLG is a community group that was formed in late 2004 to attempt to deal with a proposal to build a large windfarm in close proximity to the National Trust classified historic village of Taralga in NSW.
That the proposal arose as a result of secret, obviously lengthy, negotiations between the developer and only a few selected landholders, on whose properties the turbines were to be hosted, was the initial cause for concern.
During the initial consultative process, such as it was, undertaken by the proponent subsequent to the announcement, various residents became aware that many of the issues were being glossed over. To those of us who understand energy conversion technologies, it soon became clear that outrageous claims were being made by proponents of wind energy as to the amount of electricity that would be generated. In short, something fishy was going on.
About this time, Development Applications with the release of the relevant Environmental Impact Statements (EIS) for two other windfarms in the region became available. In the case of one of these (Crookwell II), NSW Department of Planning staff (DoP) arranged a community consultation meeting. During the meeting, it became clear that the information being presented by DoP staff was deficient. The subsequent release of the Planners' assessment confirmed their almost complete ignorance of both the Environmental and the Occupational Health and Safety issues associated with this technology.
As a result, members of the Taralga community felt that the impact of the proposed windfarm on Taralga village and the wider region could not be properly assessed by the NSW Department of Planning.
What also became apparent was that the NSW government seemed to have an agenda to fast-track the building of windfarms, and to allow the construction of as many as possible. Invariably they were to be located in rural areas along the Great Divide, and invariably, as no surprise, almost all of the proposals sprang up in Conservative electorates.

During the assessment process for the Taralga proposal, and particularly once the Department's assessment document was published, it became clear that we, the TLG, were driving some aspects of the assessment and that we, and other members of other regional communities impacted by similar proposals, were having some effect. Statements which had appeared in the Woodlawn and Crookwell II assessments, and which we had shown to be incorrect, had been modified or removed from the Taralga assessment. Nonetheless the Flora and Fauna, Visual and Noise impact assessments were to us completely inadequate. In particular, it was clear that the planners

completely ignored recent research, research available before the Taralga Wind Farm Development Application was submitted. This ignored material was included in the research papers which we had ensured were placed before the planners during the assessment process. The Department preferred to rely on desk-top studies provided by the developer rather than commission its own reports.

It also became clear during the assessment period that the claims made by both the proponents and the NSW government regarding greenhouse gas abatement (GGA) by the proposed windfarms were simplistic and, as a result were, and continue to be in subsequent windfarm approvals, grossly exaggerated.

This claim will be substantiated at a later part of this submission.

In January 2006, the Minister granted consent to the building of the windfarm, albeit with a reduction in the number of turbines from 62 to 54, supposedly on the grounds of visual impact on neighbouring properties.

The only recourse that a community has, in NSW, is to appeal an approval such as this in the Land & Environment Court. This process is extremely expensive, requiring legal representation and the calling of (and paying for) expert witnesses on identified areas of dispute, and requires special expertise of community members, (expertise not normally found in the community). In the case of an appeal against a technological development as unfamiliar as a windfarm, any such appeal is destined to founder without such expertise.

Question
Why should the community be subject to these imposts?

We decided to lodge what is termed a Class 1 Appeal with the Land & Environment Court. Ultimately it cost us over $134,000 in associated costs.

The point being made here is the inherent unfairness in the Planning Process in NSW.
The only recourse is through the Courts as there are no checks and balances on the DoP staff on the validity or quality of their assessments prior to the recommendation being submitted to the Minister for Planning. In the (unlikely) event that the Department rejects the development application, the Minister can still overrule the Department's recommendation. The Minister may also preempt the Department's recommendation. To add to the unfairness, it would seem that even where the Court may rule in favour of the Appellant in regard to the Minister's decision, the Minister can still overrule the Court's decision.

A parallel case example is pertinent. At about the same time, a community group in the Hunter Valley took the Minister for Planning to the L&E Court over the proposed Anvil Hill coal mine development. The Judge (Justice Pain) found in favour of the Appellant, on the grounds that the Minister had not properly assessed the greenhouse gas (GHG) impact of the mine. As we all know, the Minister subsequently overruled the Court's decision, and approved the mine development anyway.

Recommendation
There should be a Hearings process prior to the completion of the assessment process where the DoP can be cross-examined by experts on behalf of the community, and, where deficiencies in the assessment are found, the DoP and the developer can be required to start afresh.

(In this respect, it is pertinent to note that Victoria has such a Hearings process, called the Victorian Administrative Appeals Tribunal (VCAT). Here then is an example of the inconsistencies in the planning process across the various State jurisdictions.)

Outcome

The outcome was that the Judge upheld our Appeal, on the grounds of visual impact, noise impact, flora and fauna impact. In short, the developer's EIS was completely flawed. Nonetheless, the Judge permitted the development to proceed, on the grounds that the project "may" provide GHG savings: i.e. that "the greater good", outweighed the impacts on the neighbouring landholders. This is the sort of ruling given in the case of a mine, a road, a rail link, where, clearly, it can be argued on cost/benefit grounds that there is a community benefit.
But there are a number of aspects of the decision which are of great concern, and it is these on which we would like to concentrate in this submission.

- There was no test to determine whether the claimed community benefit - the reduction in GHG - had any foundation.
- The Judge chose to introduce to the Decision the findings of the Stern Report as the grounds whereby the development should proceed, that, in effect, we, the Appellant, should abide by these findings.
- None of the Stern findings, or their applicability to the proposed development's impacts, were discussed or debated during the Court proceedings.

Interestingly, the findings of the same Stern Report which were also applied to the Anvil Hill coal mine decision do not seem to be similarly binding on the Minister for Planning in that development. Why?

The Great Wind Rush

Inadequacy of the assessment of the Environmental Impacts of Wind Turbines

The inadequacy of the NSW Department of Planning's ability to properly assess the environmental impacts is considered in relation to the Noise, Flora and Fauna, Hydrogeological and Land Take impacts. By "Land Take" is meant the actual amount of land required to be used for the development, including that for the wind turbines and their base pads, that which must be used for new access roads and roadworks, site substations, internal transmission lines and any other infrastructure. It does NOT refer to the total land extent of a hosting property. The listed aspects are chosen here as they are areas in which the TLG has some expertise, but any proper study of impacts should not be restricted only to these potential impact issues.

Noise

At a Community Consultation meeting held in Crookwell which was hosted by DoP staff, members of the TLG became aware that incessant noise is an issue for neighbours of the present small windfarm at Crookwell. This prompted a visit by myself and my wife to the village of Toora in South Gippsland in Victoria to see for ourselves the issues affecting neighbours of the wind farm there. This visit coincided with the making of a *60 Minutes* programme segment there, so it was possible to attend the associated community meeting and hear at firsthand the stories of some of the affected residents.
Discussions confirmed that those living near Windfarms are suffering immense disturbance to their amenity, and as a consequence undergoing enormous personal suffering. This issue clearly warranted further investigation as to the likely causes of the noise and why it had gone undetected. The first inklings that the wind industry was in denial arose at this time - people were clearly suffering, through no fault of their own, yet the wind industry response was invariably that "they are anti-wind activists", and/or "they're imagining it".
At about this time, we became aware of a paper by a Dutch researcher Dr Frits van den Berg, (van den Berg, 2004), wherein he described, perhaps for the first time, measurements of wind turbine noise at night, and, importantly, proposed a mechanism as to why the turbines appeared to be, or in fact were, so much louder at night than during the day.

What was very significant about this paper was that van den Berg identified the meteorological phenomenon known as the night time temperature inversion as being the cause of the higher sound levels at night at certain wind farm sites. The occurrence of this phenomenon is widespread throughout the world and occurs almost invariably at any inland location.

The fact that the Taralga district, and indeed any location on the wider Southern Tablelands region, commonly experiences frosty and/or foggy nights, at any time throughout the year but particularly during the period Autumn through Winter to late Spring, indicated clearly that the region is subject frequently to the night time temperature inversion condition. This indicated clearly that night time noise from any wind turbines constructed here was a matter that would have to be addressed in any development proposal.
There was no consideration at all of the likelihood of the occurrence of this phenomenon in the Taralga proposal. Indeed, the proponent airily assured residents that noise would not be a problem.

The initial paper of van den Berg (2004) indicated that a safe distance margin between any wind turbine and the nearest residence would be a minimum of 2 km. At that time the wind industry was quoting a figure of 400 metres as being sufficient.

Discussions with the affected residents at both Crookwell and Toora indicated that, at a distance even as far as 1.2 km, the noise can be unbearable.

We as the TLG brought both these research papers and the local noise issues to the attention of the DoP staff. For the purposes of the Taralga windfarm assessment, it would seem that they chose to ignore van den Berg's findings, even though his first paper would have been available to the proponent prior to the preparation of the Taralga wind farm development application and EIS.

The TLG brought Dr van den Berg to Australia, at its own expense. Dr van den Berg gave public lectures in Goulburn, at the ANU in Canberra, had meetings with Planners in Victoria, and gave a presentation to the Australian Acoustical Association in Sydney. He visited the Taralga site, staying in Taralga for 4 days. He visited several other proposed wind farm sites in NSW and visited the Toora location in Victoria. He also appeared as an expert witness at the Taralga Appeal.

Interestingly, the Judge in the proceedings disallowed Dr van den Berg from giving any evidence on meteorological matters, even though this evidence is crucial to the understanding of the so-called "van den Berg" effect, on the grounds that Dr van den Berg has no formal qualifications as a meteorologist. His qualifications to speak on a subject on which he obtained a PhD goes unquestioned in other forums.

Since the Taralga Appeal, the Department of Planning now requires windfarm developers to measure the frequency of occurrence of the night time temperature inversion at a proposed wind farm site. It is also relevant to mention that the NSW Industrial Noise Policy (INP) has, for some years now, required that developers in rural areas in particular must take into consideration the effects on sound enhancement at night due to the temperature inversion phenomenon. In NSW however, Wind farm developers are required to make proposals according to what is known as "The South Australian Guidelines" (Anon, 2003), which makes no mention of the temperature inversion phenomenon.
The SA Guidelines are much less stringent than the NSW INP. Other forms of development are much more carefully evaluated for noise emissions. The problem with wind turbines, unlike other developments, is that it is virtually impossible to reduce noise at the source, by the provision of screening, etc. Also, the noise is generated while ever the blades are in motion, and the level is relatively unchanged, whatever the power levels being generated. Wind turbines are generally sited in windy places, so they turn almost continually (in the case of Taralga the developer estimates 93% of the time), generating noise. Even when generating a mere trickle of electricity, which is most of the time, they are generating noise - both mechanical and aerodynamic.
The result, then, is that in locations subject to the night time temperature inversion, a wide region is subject to a continual, incessant, boom-box type of low-frequency beating noise - something which, like a dripping tap, is extremely annoying, extremely irritating, causing sleep disturbance and anxiety in many people, night after night.

Flora and Fauna

It is easy to tout the benefits of "clean and green" energy but to date there seems to have been little consideration of the unacceptable impacts that renewable energy may have on the flora and fauna.

Australia has the worst record in the world for mammal extinctions and compared to other countries, plant extinctions are high.

NSW EPA figures: 22% State's land mammals presumed extinct
41% threatened
17% birds threatened
6.5% reptiles threatened
20% amphibians threatened

Australia is one of only 12 'megadiverse' countries that together account for 75 per cent of the world's total biodiversity. (Source: NSW Dept. Environment & Conservation, 2007)

These figures are appalling, particularly in a country such as Australia with such a small population and a vast land mass.

Birds and bats

Australia still has both a large number of species and large populations within species of native birds and bats, notwithstanding the claims that we are destroying both at a very high rate.

That we still have such numbers is in great contrast to, for example, Western Europe, where thousands of years of intensive patterns of human occupation can be expected to have, at the very least, radically changed the mix and numbers of avian species, and have very likely radically reduced numbers and long since rendered extinct many species.

At present, the largest numbers of wind turbines in the world are located in Western Europe. We know that the hundreds of wind turbines in Spain, for example, are doing an excellent job of exterminating birds such as eagles, ospreys, vultures - the birds of prey, and also migratory species.

In the Taralga Windfarm Appeal there were Court appointed experts (CAE) in flora and fauna. These experts indicated there were serious deficiencies in the proponent's Environmental Impact Statement (EIS), on which the NSW Department of Planning's decision was based.

These Court appointed Flora and Fauna experts found that there was a significant likelihood that endangered and vulnerable flora and fauna under both Federal and State legislation, could be detrimentally affected by the development. (25 species of flora and fauna identified as Federal or State endangered, threatened or vulnerable were found to exist or live near or at the development site.) They found that further detailed surveys and studies need to be undertaken over all seasons. These findings were basically dismissed by the Court, or given token consideration. As an example of the tokenism, the Judge found (in spite of the fact that the CAE for fauna, Dr Charles Meredith, estimated that the rate of kill could be as high as three birds per annum) that an appropriate compensatory payment to be made by the developer would be $1500 per eagle killed to be paid to the NSW WIRES organisation. As we understand it, this amount is significantly less than the standard fine in NSW for killing an eagle, or disturbing a nesting or roosting site. That, if the eagles were killed by wind turbines then a lesser fine is imposed, is little short of disgraceful.

In the broader Australian context, it is useful to report that, as part of the Taralga Appeal, the same CAE for Fauna testified that the small windfarm at Woolnorth on the coast in north-western Tasmania is already killing Tasmanian wedge-tailed eagles at faster than their replacement rate. Further, that as these birds are territorial, the windfarm acts as a "sink" for a much wider region as other individuals move in to occupy the now-vacant territory. (The significance here is that the Tasmanian wedgetail is different to the mainland species and is already listed as endangered.) The

CAE is the CEO of the company which has the job of monitoring bird kills at Woolnorth. There are also reports of Albatross being killed at Woolnorth. These are from the officially listed results.

We know that at the small windfarm at Crookwell, which was monitored for bird kills for some 12 months after commissioning, is doing a very good job of both killing and reducing the Australian magpie population in that region.

We already have the recommendations of those who support the use of wind energy that thousands of these very large machines will need to be deployed if any useful proportion of wind energy is to be included in the electricity generation mix (Rutovitz *et al*, 2007). So, the landscape, and bird and bat flight lines, would be littered with these machines. Avian collision is unavoidable.

The Australian Conservation Foundation, Greenpeace and the World Wildlife Fund - all these Organisations are doing all they can to save the whales but here we see that they sanction the mass destruction of bird life in Australia by backing windfarms.

Our future energy needs must not come at the expense of our flora and fauna. As we are becoming more aware of the environment we live in we must be careful in considering the effects that renewable energy sources place on our flora and fauna. We seem to be too focused on carbon emissions to consider the **whole** environment.

The principal claim of this submission is that building windfarms to address climate change is a very expensive, pointless, futile exercise.

Why then should Australia, with its unique bird and bat populations, by going down this wind energy path, cause what may well be the greatest single extermination, the wholesale destruction on a massive scale, resulting in the mass extinction, of native bird and bat species, since human occupation of this ancient land?

Hydrogeological

Each wind turbine requires a reinforced concrete base or pad the size of three double decker buses and having a total mass of around 1000 tonnes. For the Taralga windfarm this would equate to around 62,000 tonnes of reinforced concrete. That such a pad could have significant impacts on the soils below, particularly on highly erodible ridgelines - which is where these structures are generally sited - seems to be of no interest to the NSW DoP. These concrete constructions become a permanent addition to the landscape. They cannot be, and are not required to be, removed at the end of the life of the windfarm when other restoration of the site is supposed to be undertaken. Each wind turbine requires a permanent access track and at each turbine site the construction of a crane pad. Each track has to bear the weight of both the massive vehicles required to transport the tower sections, nacelle and blades, and the giant crane required to construct the wind turbine. These tracks also remain permanent features of the landscape. Again, the DoP seems to take no interest whatsoever as to the impacts of the necessary roadworks, the possible gully and hillside erosion likely on the possibly steep hillsides as a result of blasting and clearing of the ridges on which the wind turbines are invariably situated. Further, the issues associated with the required access track and road construction seem to be of little interest to the NSW DoP.

Land Take

There are very important ramifications to the potential widespread introduction of wind farms as a supposed significant source of "renewable" energy on the National Grid. The Taralga wind farm, of 62 wind turbines, with an installed capacity of 186 MW (although the average output is likely to be no more than 30-40 MW) will require 12 ha of new access roads, and significant widening and reinforcing of approximately 12 ha of existing tracks. This is apart from land required for the wind turbine pad footprint, and also apart from the necessary forest destruction for some rows of wind turbines. It also does not include the land take for the internal-to-site transmission lines, the site switchyard, or the 32 km of high-voltage 132 kV transmission line to the connection to the National Grid near Marulan.

This is a huge "land grab". In addition, as will be shown later, as the average power output for wind farms in NSW has very likely been overestimated, the likely land take for the required numbers of wind turbines in multiple windfarm developments to make any significant contribution will be staggering. Again, the DoP has no interest in the environmental implications of this technology. The introduction of these machines, depending on the chosen sites, could require clearing of native and other woodland on a massive scale.

For comparison, a 600 MW open-cycle gas turbine plant recently proposed for siting at Uranquinty near Wagga Wagga, requires 4-5 ha, approximately, including the staff car park. It is adjacent to a sealed road, is supplied from an existing natural gas main, requires some 30 km of transmission line easement adjacent to an existing transmission line easement to connect to the nearest Transgrid substation, and has clear greenhouse gas abatement benefits over comparable coal plant. Any noise issues can be dealt with at source. Importantly, unlike wind energy, this form of generation is, aside from maintenance downtime, a controllable, reliable source of electricity.

Flawed Approach by Governments

Cost/benefit analysis of wind turbines

It is relevant that there is no proper assessment in the public domain, to the author's knowledge, of the likely performance of wind turbines in New South Wales. The NSW Sustainaable Energy Development Authority (SEDA) produced a Wind Atlas for NSW. This purports to show the sites in NSW having the greatest wind energy potential, but as has been found subsequently, this type of study does not provide results which automatically translate into a guaranteed source of energy.

In relation to the lack of any proper assessment of wind farm likely performance, I am reminded of the story, published by Hans Christian Andersen in 1837, called "The Emperor's New Clothes". I am sure that all are familiar with this cautionary tale, and I would like its lesson to be kept in mind in regard to the ensuing discussion of the findings in relation to windfarms.
We all want to believe, that the so-called "Renewables" will offer a clean, green, impact-free source of energy - energy able to be generated and distributed by the most convenient means. The current most convenient means is as electricity via the national grid.

For many who want to believe this, they are prepared to forego disbelief, and in the case of governments, desperately prepared to be seen to be "doing something", something that is very visibly "clean and green". In the case of government planners, this desire may lead too easily to an agreement with the developers of wind energy to "lower the bar", to forego the proper environmental impact assessment, for these sorts of developments.
Is this a rational approach, does it have any justification?

Supposed advantages of wind energy

- Energy supply is described by many as "free", "non-polluting", and "inexhaustible".
- Unlike, for example, solar, wind energy is potentially available 24 hours per day.
- The technology is seemingly relatively easy and cheap to implement - at first glance, does not seem, unlike solar photovoltaics, to require expensive collectors. Also, because wind turbines are rotating machines, they are able to provide AC output directly without expensive DC-to-AC conversion so it would seem trivially easy to connect to the national grid.

Disadvantages of wind energy

- The wind is a very low-density source of energy - much less than solar for example - the collectors need to be large, indeed very large, for a given unit of energy, and there needs to be many of them.
- The wind is an intermittent, unpredictable and totally unreliable source of energy - direct connection to the electricity grid where there is no means of large-scale energy storage immediately poses potential problems of increased instability and unreliability for the operators of the grid.
- The power generated cannot be stored for use in a high energy need situation, but rather is generated in any instant and gone in that same instant.
- The generators require back-up generation to be available at all times.
- The generators draw power from the grid in order to operate (so-called "ancillary services"), but this draw down of power is never factored into their projected power generation as a nett output.
- Favourable locations are at the tops of ridges - there is the potential to be very unsightly and, more importantly, pose a runoff and erosion risk from both the turbine site and the required access roads.
- The fact that the device is a large screw propeller means that it generates downwind turbulence - this is an inherent source of noise.
- That it is a large, rotating screw propeller means that it poses a significant collision risk for avian species.

There is little point in considering here the supposed advantages in more detail than as listed above. These are espoused in, for example (Rutovitz, 2007) and in many other publications. It is more useful to examine further the ramifications of those disadvantages not already addressed in the discussion of the Taralga Appeal.

Low density energy source - ramifications

Apart from the fact that the collectors need to be large, there is a very simple corollary: the lower the energy density, the more materials and quantity are required in their construction. Keay (2007) has shown, to take the extreme example, the difference in the quantities required of two materials - steel and concrete - between two energy sources - wind and nuclear - presuming that the two plants provide a similar level of power output. His choice of 2250, 2 MW, wind turbines as being equivalent to a 1000 MW nuclear reactor gives the wind plant an overall capacity factor of 22%, and neglects wind's intermittency and variability, all of which favours the wind installation. Nonetheless, his findings are pertinent:
"A 2250-turbine wind farm therefore needs 562,000 tonnes of steel and 2.25 million tonnes of concrete."
The nuclear reactor meanwhile: " The amounts for the nuclear equivalent are 35,000 and 200,000 tonnes respectively."
"In round figures the wind farm uses 12 times as much material as the nuclear plant."

This huge amount of extra material, even though it is not consumable items, does have a very significant additional energy cost in its production and fabrication. Because of this energy cost, "The wind farm's [construction] contribution to global warming in terms of energy production alone will be 12 times that of the nuclear power reactor."
Then of course there's the not-so-small matter of the space that has to be provided and occupied by this low-energy source:
"A wind farm of 2250 turbines demands huge tracts of land cleared of trees (another contribution to global warming), high load-bearing road access during construction and maintenance, and an expensive transmission system because of its dispersed extent."

"By comparison the nuclear reactor is compact, requiring less than a square kilometre of land overall, including either access to cooling water or the provision of a pair of cooling towers (access to some water is still needed for making up evaporation loss by the towers) and a storage pool for spent fuel." The fact that the reactor is a single plant means that the cost of the provision of the transmission system would be small by comparison.

To indicate that Keay's analysis is very relevant, it is useful to see what the recently-published "A Bright Future" (Rutovitz *et al*, 2007) suggests as being a reasonable (in their view) way to achieve 10% of Australia's required electricity in 2020 from wind energy:
"Supplying 10 per cent of Australian electricity by 2020 would mean 11,000 MW of wind, up from just 817 MW now. This would require an additional 100 medium sized wind farms with 5100 turbines. In comparison, Germany is about half the size of NSW and already has more than 16,800 turbines."

Assumptions:
The 11,000 MW installed capacity of wind is deemed equivalent to nine 1000MW coal plants at 85% capacity factor [for the latter].
The assumed overall capacity factor for the wind turbines is 30%.

The number of 5100 turbines assumes each turbine is rated at 2 MW installed capacity and there are 50 turbines per wind farm.

As shown by Sharman (May, 2005), the number of wind turbines required for a given required level of power output is very sensitive to the value of the capacity factor. If the actual value of the capacity factor turns out to be much lower than that calculated, then the financial penalty, due to the lower in-fact 'green power' contribution or the required additional number of turbines, the extra land take, the road and transmission system requirements to achieve the projected contribution, can be staggering.

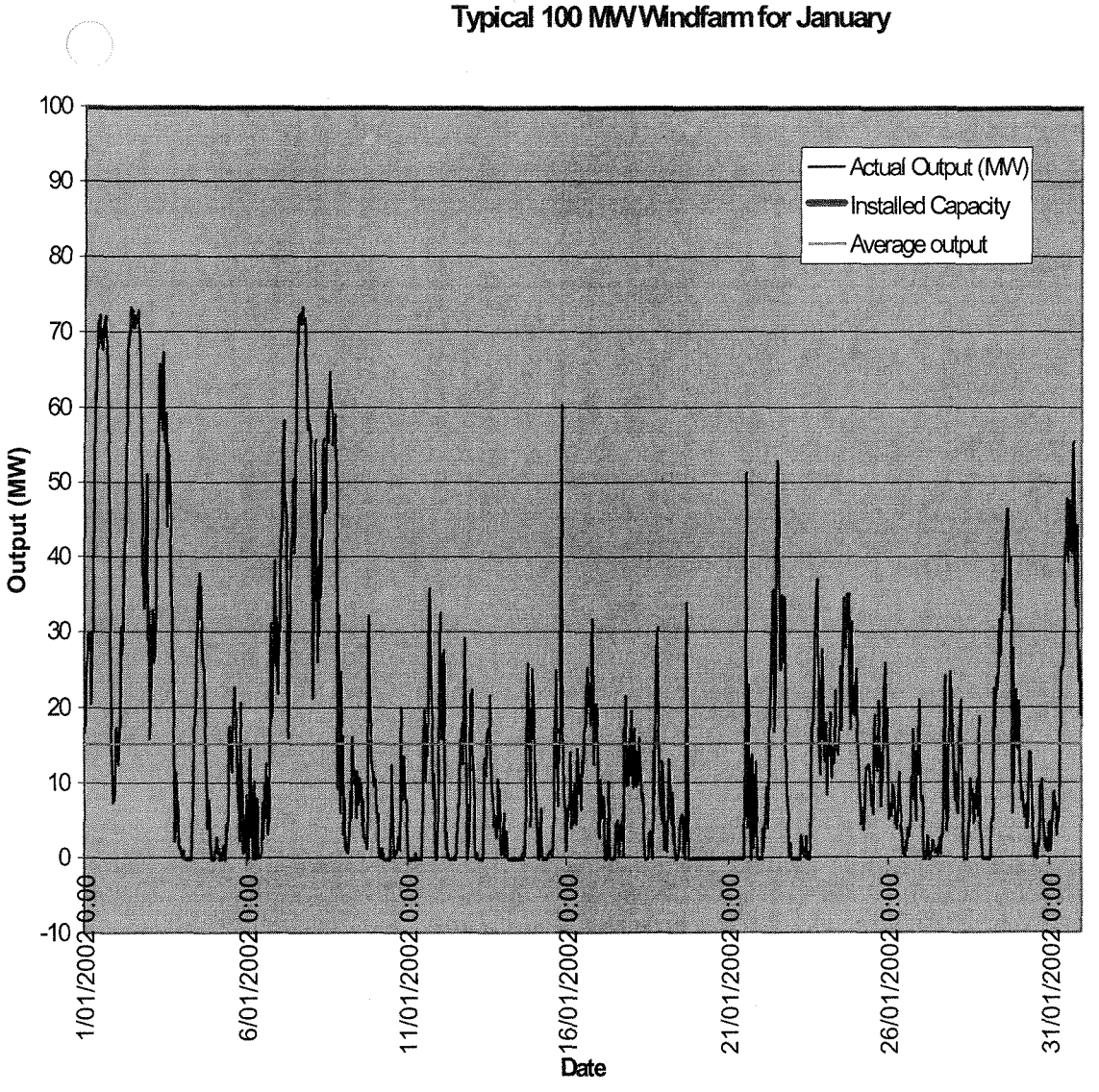
It does not matter how many wind turbines are built, or where they are situated, the required backup electricity generation capacity has to be provided, in addition, by other, reliable, deterministic plant. Where the other source is GHG-emitting, the windplant might save some fuel, but if the other source is non-GHG-emitting, then for the reasons given above, there is little if no justification at all for building a windfarm.

Intermittency, unpredictability of wind, implications as to grid instability

The oft-repeated claim, which is more an article of holy writ or mantra to the wind industry, that a grid can accept up to 20% wind penetration, is an argument that is not sustainable.. The industry often cites Denmark as the model, where the installed wind generation capacity is indeed 20% of Denmark's installed capacity.
However, note that this is installed capacity, it is not the average generation figure, which as shown below, is much, much less.

It is also very important to note that Denmark is very tightly and extensively coupled to the rest of the European grid via high-capacity interconnectors which were constructed between Germany and both Norway and Sweden to connect these countries to the German grid. These, perhaps fortuitously, pass through Denmark (Sharman May, 2005), and are connected into the West Denmark grid. The capacity of these interconnects is in fact approximately the same as West Denmark's installed wind capacity, and it comes as no surprise that they are used extensively to shunt excess wind energy from West Denmark to that country's neighbours. In effect, the installed wind capacity is a very small proportion of the wider European grid - which is much, much larger than the Danish grid. The reality then is that the level of penetration is much, much lower. That the larger grid is already in difficulty dealing with the current level of windpower in Europe was very clearly demonstrated by the events of the night of 4 November 2006. The otherwise routine disconnection of a single interconnector (to permit a large ship to pass safely under the cables) in Northern Germany, followed by an unexpected surge in the wind energy, lead to a Europe-wide blackout incident which took many hours from which to recover (Anon 2006).
The claim, on the basis of the Danish experience, that wind power can reach a 20% penetration figure before problems of instability arise, is therefore completely unsubstantiated.

In Australia, there are problems due to wind's intermittency and variability already occurring in South Australia and Victoria (Macaulay, 2006), ie at much less than the claimed 20% level.



The only ways to deal with the variability, which involves the rapid variation of both the required compensatory reactive power infeed to the windfarm, and the rapid variation in the output, are to provide:

(i) the installation of very expensive equipment, called fast-acting, thyristor-controlled, staticVAR compensation to deal with the rapidly-changing levels of reactive power requirement,

(ii) the installation of fast-acting, fast ramp-rate generators, which can compensate for the rapidly-changing power output levels - typically open-cycle gas turbines (OCGT).

It is highly relevant to note that in the provision of the latter, this needs to be above 90% of the installed wind generation capacity. So, 1000 MW of wind requires at least 900 MW of OCGT plant.

In relation to the matters of lower-than-predicted performance, and the levels of intermittency and variability, actual output data from two windfarms in Australia is reproduced here.

The first diagram is the output for the month of January for a windfarm located in inland Australia. The salient features of the diagram are:
(a) the output never reaches 100 % of installed capacity,
(b) the average output is a meagre 15% of the installed capacity,
(c) the actual output is less than 10 % of the installed capacity for more than 70 % of the time,
(d) the intermittency and variability are extreme.

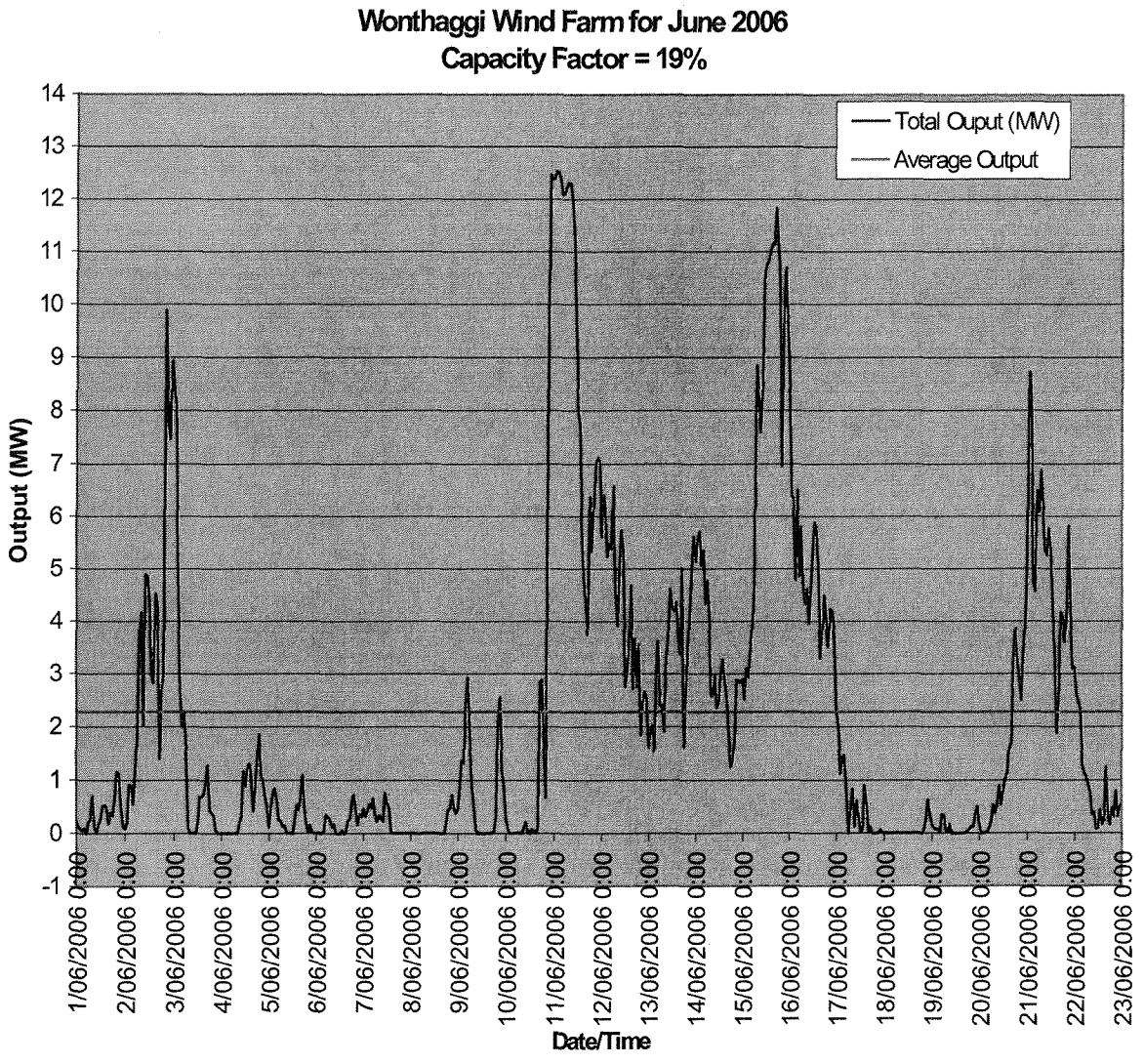
What is particularly relevant from this first diagram is that the windfarm's performance is well below the initially expected 35 % capacity factor. Indeed, if this were a normal generator, the investors and shareholders would be calling for the CEO's resignation!

The second diagram shows the output of a windfarm on coastal Victoria, near Wonthaggi in South Gippsland. Again, although the actual performance is not as bad as that of the inland windfarm in the previous example, the result is still very disappointing, because windfarms on Australia's southern coastline are expected to be in an excellent wind regime.
Note that the output characteristic is no less intermittent and rapidly-varying than seen in the first example.

Using the actual values of capacity factor, rather than the optimistic value of 30% blithely quoted in, for example, "A Bright Future"(Rutovitz et al, 2007), even assuming the equivalence of intermittent wind to deterministic plant, is cause for considerable concern.

At the Wonthaggi capacity factor of 19 %, the number of turbines (5100 in the above report) rises from 5100 to 5100x0.3/0.19 = 8053
At the inland site capacity factor of 15%, the number of turbines doubles to 10,200.

These results amply demonstrates Sharman's (*ibid.*) concerns regarding the importance of properly estimating the capacity factor. The implications for the increase in both the capital and construction costs, and the land take (and hence environmental impacts), are indeed staggering.



The characteristics of intermittency and rapidly-varying output have profound implications when it comes to the calculation of supposed greenhouse gas offsets.

The windfarm output results examples shown are not especially selected as extreme. It may need to be stressed that these particular examples are reproduced here because they are the only example sets of data presently available to the author. The wind industry is normally extremely careful to keep this information well concealed, hiding it behind all sorts of spurious reasons for concealment. The most commonly proffered is the claim of "Commercial-in-Confidence". The reality of course is that only the commercial pricing information is a C-of-C item. That the actual performance is so "spiky" and intermittent comes as somewhat of a surprise to many observers. The question that is subsequently often asked relates to the likelihood of the owner receiving any useful financial return. What needs to be understood is that the return is paid on all electricity generated, no matter when or how much: this is why the wind industry in particular has worked so assiduously at obtaining the "unscheduled generator" classification.

These performance diagrams make clear why the claimed greenhouse gas offsets could be overstated. They also make clear why the claim, that wind generation is easily integrated into the electricity grid, is false.

A matter which needs to be addressed as a matter of urgency is the fact that it would seem that the NEMMCO (the National Electricity Market and Management Company) is unaware of the instantaneous amount of wind generation on the grid at any time. The only parties that are aware of the amount of wind-generated electricity are, apparently, the specific buyer/seller pair. It is as if the Australian Railway network had feral trains operating on its lines, unknown to and under the control of no one. (The railway rather than the road analogy is the more useful because the grid can only be operated by the controllers following stringent standards - there are no overtaking lanes or dual carriageways on the National Electricity Grid!)

Greenhouse Gas Calculation

Wind farm developers in their development applications and government press releases subsequent to the granting of development approvals constantly use phrases such as "will power 40,000 homes and offset 250,000 tonnes of greenhouse gas emissions". How are these figures arrived at? Are they peer or independently reviewed?
Both calculation forms are simplistic, and the figures used are open to interpretation.

The form use for the number of homes calculation is:

No. of homes = Average annual output (MWh) / (Average annual household consumption)

The form used for the greenhouse gas offset calculation is:

GHG offset = {Annual output (MWh)} multiplied by (the pool coefficient)

> Where the "pool coefficient" is the generally agreed value of the conversion coefficient by which any per annum value of electrical power produced (in MWh) is multiplied to determine the equivalent total amount of CO_2 in tonnes per annum which would be produced in the case of a coal-fired generator, or saved in the case of a non-fossil-fuel plant such as, for example, a wind or solar generator.

A sample calculation is provided in the Appendix.

As is shown in the Appendix, the figures of number of houses supplied and GHG abatement for the Taralga proposal are not based directly on the proponent's measured wind data. They were based on the data for some notional 1 MW wind turbine in NSW - a figure agreed and accepted by the NSW government.

In how many other wind farm proposals, and in how many other State jurisdictions, are these "calculations" similarly based on the expected performance of some previously-agreed notional wind turbine?

What is clear from the form of the above formulae is that there is no compensation term to permit the subtraction of the required backup power, or the required "ancilliary services" power. Consideration of the provision of backup power is complex, but even the fact that there is no allowance given for the situation where the wind is not blowing, (so the homes have to be powered by other forms of generation), should be a warning that these formulae are simplistic in the extreme.

Perspective

Attached is a diagram entitled "NSW Energy Flows 2000-2001". I am advised that it was published by the NSW Department of Energy Utilities and Sustainability (DEUS). It is useful to compare the thickness of the blue line (relative input from "hydro and other renewables") with that of the various sections of the purple bands (energy flows from coal). An expansion of the wind energy sector in NSW, to the extent suggested by Green lobby, even neglecting the intermittency issues, might just double the thickness of the blue line in that diagram.
Does NSW and Australia really need the staggering cost and scale of environmental and community impacts for this sort of outcome?

Conclusion

What has become clear in recent years is that, around the world, wind energy has manifestly failed to deliver on its promise. A wide ranging recent overview can be found at (Adams, 2007).
Giant wind turbines do generate electricity, but not much, and certainly much less than promised by preliminary, perhaps not sufficiently detailed, studies. The intermittent and highly variable characteristics of the electricity generated by wind farms pose very significant challenges for the grid operators in managing the infeed from this form of generation. In addition, the often very rapid ramp rates due to the variability cannot be compensated for by backup generation where this is provided by slow ramp-rate thermal plant.
Further, the need for rapidly-varying backup from coal- or gas- fired plant, where this is all that is available (which is the case on mainland Australia), significantly reduces the amount of greenhouse gas emissions offset by the wind plant.

Given that the viability of wind generation is so marginal, there needs to be much more careful thought given to the idea of cluttering up the Australian countryside with thousands of these generators, given that the only outcomes are likely to be

- Massive bird and bat strike leading perhaps to the greatest mass extermination and extinction of avian species in Australia's history as a result,
- Sterilisation of some of Australia's prime farmland, simply because people can no longer live on their properties due to incessant night time noise from the nearby wind turbines and a loss of amenity in their 'workplace' by day,
- Wholesale destruction of rural communities, both as a result of people leaving their properties, and because of the community division brought about as a result of the inherent unfairness resulting from the placement of these machines,
- No useful greenhouse gas reduction to offset the many negative side effects of this form of power generation.

What must be addressed as a matter of urgency at both National and State level is the rampant behaviour of the wind industry. To date the industry's behaviour has been characterised by denial of all these issues including the environmental impact issues. Their behaviour has been characterised by a demonstration of a complete lack of responsibility in their willingness to face up to and properly deal with the issues.

As the Taralga Landscape Guardians, we request that the Federal government, as a matter of urgency:

- Places a moratorium on the further development (including construction) of all new wind farm proposals, both approved and under consideration, until these and other impact issues have been properly addressed by the development of a National Planning Code.
- Adopts procedures and processes whereby the wind industry, whose present behaviour is in many cases more akin to that of itinerant carpetbaggers and snake-oil merchants, is instead required to properly address its responsibilities to the local communities into which it wishes to shoehorn its giant industrial projects.
- Ensures that the wind industry be required to carry out full and proper environmental impact studies prior to lodging windfarm developments, including proper and rigorous cost/benefit analyses, just as every other electricity generation project is required to do, and to have these studies and projections peer and independently reviewed.
- Commences the development of a National Code for Windfarm Planning Guidelines, that this be adopted after careful consideration of input from all interested parties, so that, at a bare minimum, the issues raised in this submission are fully and properly addressed by any and all wind energy development applications throughout Australia.
- As an adjunct to this process, to seek to put in place a uniform planning process across all jurisdictions, enabling a Hearings process or similar prior to planning approval, such that individuals and communities are not required to resort to expensive Court procedures in the first instance, as we had to do with the Taralga proposal.
- Legislate that the electricity outputs from all generators, including so-called "unscheduled generators" such as wind farms, into the national grid be required to be placed in the public domain. This could perhaps be in the form of annual reporting, or similar timely fashion. This data would be in the form of the 30-minute settlement power output data presently available in the NEM for "scheduled generators" (less of course any pricing information which is properly a matter for the power purchase agreements between generator and customer).
- The MRET scheme be revamped so that all 'so-called' renewable generators are required to provide detailed calculations, by procedures which would be updated from time to time as better knowledge becomes available, as to the expected greenhouse gas emissions offsets that their technology would produce. These calculations would properly include debits for all required "ancillary service" backup, and that a full and rigorous audit process addressing the veracity of the claimed calculations, be put in place.

Paul Miskelly
President, for, and on behalf of,
The Taralga Landscape Guardians, Inc.

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