Submission to Senate Standing Committees on Environment and Communications

by

Parkesbourne/Mummel Landscape Guardians Inc.

In re:

Renewable Energy (Electricity) Amendment (Excessive Noise from Wind Farms) Bill 2012

October 2012

Parkesbourne/Mummel Landscape Guardians Inc.

30 October 2012

Committee Secretary
Senate Standing Committees on Environment and Communications
PO Box 6100
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Canberra, ACT 2600

Dear Committees

In re: Renewable Energy (Electricity) Amendment (Excessive Noise from Wind Farms) Bill 2012

The Senate has referred to you the above bill for inquiry and report. I understand that this is not an inquiry into wind farms, but only an inquiry into the terms of the bill. It will, however, be necessary to adduce some general considerations regarding wind farms, in order to present a critical view of the precise terms of this bill. I will restrict these considerations to what is relevant.

Before I offer a detailed criticism of the bill's terms, I should like to express my thanks to Senators Madigan and Xenophon for proposing the bill. Their concern for the health and well-being of wind farm neighbours is highly commendable, and those of us who have been campaigning for a more adequate understanding of wind turbine impacts by government are sincerely grateful to them.

I also wish to thank the Standing Committees on Environment and Communications for their interest in, and consideration of the issues.

I should declare an interest. I and my family, and my neighbours will shortly be living beside the Gullen Range Wind Farm near Goulburn in NSW. This project has been approved, but is not yet built. However, it is now in process of construction, and the developers have announced that the wind farm should be completed by the end of 2013.

My house is 1.7 km from the nearest turbine, and between 1.7 and about 2 km from three or four others. The turbines stand on a ridge across the valley from us, and on ground about 150 metres or more higher than the ground on which our house stands. Night-time temperature inversions are common in autumn and winter, and even in spring. In these circumstances, and judging by the experience of the neighbours of the Capital and Cullerin Wind Farms, and other wind farms in Australia and New Zealand, and also judging from the research of independent noise researchers, I expect that my family will experience "annoyance", i.e. stress-related symptoms, and sleep disturbance. The latter is virtually inevitable, given the frequency of temperature inversions in our valley.

The Gullen Range project is about 20 to 25 km long. It originally had a proposed 84 turbines, but 11 of these have been removed from the project for the sake of the Crookwell airstrip. (GRWFMPA, 2009; NSWLEC 1444 [2009]; NSWLEC 1102 [2010]) However, we have heard that the developer, Goldwind Australia Pty Ltd, wishes to try to re-instate the 11 turbines.

According to the Environmental Assessment made for the project, the Gullen Range Wind Farm has 32 non-involved residences within 1.5 km of turbines, about 60 non-involved residences within 2 km, and 118 non-involved residences within 3 km. Most of these residences are downwind of the wind farm in prevailing wind conditions. (GRWFEA, 2008)

The Australian noise engineer Bob Thorne has stated that in his opinion, based on his research, adverse health effects can be experienced by neighbours out to 3.5 km of turbines. Other reports suggest greater distances. (Thorne, 2010)

It should be obvious to any reasonable person that the Gullen Range Wind Farm is radically misconceived, and inappropriately located. It should never have been approved. But, given the NSW planning legislation and noise guidelines, the Minister and the Land & Environment Court had no choice but to approve it. The planning legislation does not give adequate attention to the needs of the neighbours of developments. And the noise guidelines are completely inadequate to protect the health and well-being of the neighbours of wind farms.

I touch on these matters in the following submission, insofar as they are relevant to a consideration of the terms of this bill.

This submission is accompanied by a document, written by me, concerning peer-reviewed studies of the adverse health impacts resulting from the noise emissions of wind turbines. I send it to you as an appendix to the submission proper, in case the information that it contains may be of use to you in your deliberations (NSWLG, 2012).

Yours sincerely

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Overview of the Bill

According to the Explanatory Memorandum issued by Senators Madigan and Xenophon, the bill amends the Act so as "to give powers to the Regulator that ensure that accredited power stations that are wind farms, either in whole or in part, do not create excessive noise" (p. 2). This is a highly commendable intention. But, as we shall see, the terms of the bill, as it stands, are not yet adequate to the fulfilment of this intention.

Schedule 1 – Amendment of the *Renewable Energy (Electricity) Act 2000*

Items 1 to 4

These amendments add a reference to the excessive noise that wind farms may create, and provide a definition of "creates excessive noise", in relation to wind farms.

The definition of "creates excessive noise" is that "a wind farm creates excessive noise if the level of noise that is attributable to the wind farm exceeds background noise by 10 dB(A) or more when measured within 30 metres of any premises: (a) that is used for residential purposes; or (b) that is a person's primary place of work; or (c) where persons habitually congregate." (Item 4 At the end of section 14)

This definition must be considered inadequate for several reasons.

1. Wind farm noise cannot be adequately measured by only dB(A), i.e. decibels measured on the A-weighted scale. The A-weighted scale is oriented to the higher range frequencies that are used in human speech. It gradually filters out the lower range frequencies. At very low frequencies the A-weighted measurement is very inaccurate indeed. Consequently, it cannot give an accurate measure of low frequency noise (LFN) or infrasound. (Cooper, 2012; Sonus, 2010; Salt and Hullar, 2010)

   Wind turbine noise is a mix of sound across the range of frequencies from 0 Hz (cycles per second) to several thousands of Hz. There is now no doubt that wind turbines do produce low frequency noise and infrasound, or that wind turbine noise as received at residences is predominantly low frequency noise and infrasound. (Cooper, 2012; Harrison, 2011; van den Berg, 2004a; Bakker and Rapley, 2010; Dickinson, 2010)

   As wind turbine noise in Australia has only ever been officially measured in dB(A), it follows that the low frequency noise and infrasound from wind turbines received at residences has never been accurately measured by the official measuring processes, i.e. the proponent's original modelling, and the proponent's compliance monitoring.

   Therefore, it is inappropriate for this bill to define "excessive noise" from wind turbines in dB(A).

   Wind turbine noise needs to be measured in multiple ways: by dB(A) for the higher frequencies; dB(C) for low frequency noise; dB(G) for infrasound between 10 and 20 Hz; and dB(Z) for infrasound between 0 and 10 Hz. (Cooper, 2012; Kamperman and

James, 2008; Salt and Kaltenbach, 2011; Ambrose, Rand and Krogh, 2012; Thorne, 2011)

These measurements need to be taken, as the adverse health effects reported by some wind farm neighbours are associated with both audible low frequency noise, and inaudible infrasound.(Leventhall et al., 2003; Ambrose and Rand, 2011; Ambrose, Rand and Krogh, 2012) More generally, it is irrational if the predominant components of wind turbine noise, i.e. low frequency noise and infrasound, as received at residences, are not accurately measured. This subverts the whole purpose of having noise regulations.

2. A limit defined as 10 dB(A) above background noise is too high, according to generally accepted standards. Even the noise guidelines in use in Australia set the limit as background noise + 5 dB(A). (EPASA, 2003, 2009; NZS 6808: 2010; DPINSW, 2011; cf. Kamperman and James, 2008)

3. A limit set for outside a building needs to be supplemented by a limit set for inside a building. This is necessary for two reasons. First, low frequency noise and infrasound will penetrate the fabric of a building more easily than the higher range frequencies. (DeGagne and Lapka, 2008; Harrison, 2011; Berglund et al, 1996) Second, low frequency noise and infrasound can resonate inside a building, so that their sound levels are higher inside the building than outside the building. (Ambrose and Rand, 2011; Ambrose, Rand and Krogh, 2012)

4. The bill does not distinguish between daytime, evening, and night-time measuring periods. This is necessary because during the evening and at night wind turbine noise can increase because of a “stable atmosphere”, caused by “temperature inversions”. Essentially, what this means is that during the day warm air rising will refract some of the turbine sound upwards away from the residence; by contrast, in the evening and at night stable layers of cold air will send more of the turbine sound to be received at the residence. (van den Berg, 2004b, 2006, 2007; NSWINP, 2000)

5. The bill needs to require explicitly that amplitude modulation and tonality be measured, as these are a major cause of annoyance and sleep disturbance. Measurements must be made in the appropriate units, according to frequency (see above). (Bengtsson et al., 2004; Bradley, 1994)

6. I propose the following noise limits as the reference points for a definition of “excessive noise”. These are partly based on the suggestions of the NSW noise engineer Steven Cooper (by personal communication).

   Outdoor:

   - 30 dB(A) (L_{eqA}), or background noise + 5 dB(A), whichever is *lower*
   - The *lower* of the following:
     1. L_{eqC} - L_{90A}, no greater than 20 dB
     2. A maximum not-to-exceed level of 50 dB(C) (L_{eqC})
   - 60 dB(G)

Indoor:

- 20 dB(A) (L_{eqA}), or background noise + 5 dB(A), whichever is *lower*
- 45 dB(C), (L_{eqC}) or ($L_{eqC} - L_{90A}$, no greater than 20 dB), whichever is *lower*
- 60 dB(G)

There should also be limits in dB(Z), but I am unable to say what they should be. Independent noise engineers should be consulted.

For the purposes of Senator Madigan and Senator Xenophon's bill "excessive noise" should be defined as any noise level that exceeds the above limits.

In relation to amplitude modulation, "excessive noise" should be defined as a modulation of 4 dB or more. (Thorne and Thorne, 2010)

In relation to tonality, where tonality is found to be present, that in itself should constitute "excessive noise".

Note: the 60 dB(G) limit is based on the research into wind turbine infrasound of Professor Alec Salt, of the Cochlear Fluids Laboratory, School of Medicine, Washington University, St Louis, Missouri, USA, and his colleagues. (Salt and Hullar, 2010; Salt and Kaltenbach, 2011; Salt and Lichtenhan, 2011; Salt and Lichtenhan, 2012)

Item 5 At the end of Subdivision A of Division 4 of Part 2

Add:

20 AB Wind farms: publishing on internet information about noise, wind speed and direction, weather conditions and power output, [etc.]

By this amendment the wind farm operator is obliged to publish on the internet data relating to the noise attributable to the wind farm, the wind speed and direction at the wind farm, the weather conditions at the wind farm, and the power output at the wind farm.

This amendment is very desirable for the following reasons. At present, if wind farm neighbours find that they are suffering adverse noise and health impacts from the wind farm, they must hire a noise engineer to monitor noise levels and noise character (fluctuations, tonality, modulation, etc.) in order to support any complaints that they may wish to make. This can cost thousands of dollars, or even tens of thousands of dollars, depending on the extent of the measurements required. This expense may well be beyond the means of most wind farm neighbours, and is not recoverable from the wind farm operator without the further expense and risk of going to law. Therefore, whether a wind farm neighbour can obtain justice, and the redress of the grievance must depend on the extent of the neighbour's wealth. The pursuit of justice ought not to depend on wealth. This violates the principle of natural justice.

A further consideration is that if the wind farm operator learns that the neighbour is having the emissions of the wind farm monitored, the operator may run the turbines in a reduced mode for the duration of the monitoring, in order to lower the noise levels being monitored. At present, this is not illegal, nor can it be prevented by the neighbour.

It is therefore very desirable that the relevant data should be publicly available, and accessible to any wind farm neighbours who may need it. This can be assured by this amendment.

While the public provision of this data would mean an extra expense to the operator, the sums involved would be minor in comparison to the revenue generated by the wind farm. In sum, it is more fair that the operator should pay for the provision of this data than that the neighbour should be forced to pay, or to forgo the collection of the data, as a result of inadequate financial resources.

Developers may also object that the data should remain "commercial in confidence", as it is said or – to express it more grammatically – that the data should remain confidential for commercial reasons. This is a question of priorities. The developers would feel that their self-interest is more important than the interests of neighbours, as their self-interest is supposed to coincide with the general interest. Whether this is true or not, it should be remembered that the owners of renewable energy power stations have state-guaranteed markets and state-guaranteed profits, as a result of the emissions-trading system and the renewable energy target. On the other side, wind farm neighbours are subject to adverse noise and health impacts, and are unlikely to have the financial resources necessary to seek redress in the courts, and will certainly not have financial resources as large as those of the wind farm operator. It should be remembered that most wind farm operators are transnational corporations. Fairness requires that on this matter the advantage should be given to the neighbour rather than to the operator.

If it is objected that the wind farm neighbours are already protected by the compliance monitoring carried out by the proponent, and by any noise audit ordered by the Minister for Planning or the Environment Protection Authority, it must be remembered that these kinds of official monitoring will only check if the wind farm is operating within the limits of its conditions of consent. These conditions of consent will be based, in NSW and South Australia, on the so-called *South Australian Noise Guidelines* (2003 or 2009), and in Victoria on the New Zealand Standard NZS 6808: 2010. The recently proposed NSW draft guidelines are very little different from the *South Australian Noise Guidelines*. All these guidelines are completely inadequate to protect wind farm neighbours from adverse noise and health impacts. Here is not the place to prove this contention. But Committee members should be aware that there is ample documentation in the peer-reviewed literature to prove it. I can refer to studies made by the Acoustic Group Pty Ltd (2012a and 2012b), to articles by Philip Dickinson, Professor of Acoustics at Massey University, New Zealand (2009; 2010; [2012]), and to a very recent study by the NSW noise engineer Steven Cooper (2012).

However, while this amendment is very desirable in principle, it leaves unclear just what data in relation to noise, wind, and weather are to be collected and published. The measurement of wind farm noise, and its relation to wind and weather conditions is a much studied and much debated matter. There are radical disagreements between noise consultants who work for the wind energy industry, and independent noise engineers who have investigated wind turbine

noise. The intention of the bill could easily be subverted by the collection of data that is insufficient to reflect the real noise impacts at, and more especially inside, a residence.

The following are necessary: (for a discussion, see above under Items 1 to 4)

1. Measurement of wind turbine noise must be in dBA, dBC, dBG, and dBZ. Measurement in dBA alone is not adequate, as it does not measure accurately low frequency noise or infrasound.
2. There must be separate measurements for daytime, evening, and night-time noise, as noise levels can increase significantly in the evening, and at night, due to a stable atmosphere caused by temperature inversion.
3. Measurements need to be taken at residences, and not just at the turbines, or 200 metres from the turbines. This is essential, as there is much disagreement as to rates of attenuation of wind turbine sound of different frequencies. An estimate of noise received at a residence may underestimate the actual noise received, if it is the result of a calculation based on distance from turbines and an assumption as to the rate of attenuation. The assumption in the modelling may just be wrong. This is at present a very controversial matter in the debate over wind turbine noise impacts. (Dickinson, 2009, 2010, [2012])

   Also, a calculation of noise at a residence, based on the sound level at a single turbine, may underestimate the actual noise received, because noise can be increased by an array of multiple turbines. Either sound waves from a row of turbines may converge on a residence, or the wakes of a line of turbines in line with a residence may interfere with one another. In both cases noise levels will increase. (Bakker and Rapley, 2010)

   There are monitoring systems available that can monitor noise impacts at all residences within a given distance, in real time. So, the monitoring of noise at residences is not impractical. (Waubra Foundation, 2011)

4. Measurements need to be taken both outside and inside residences. This is necessary partly because low frequency noise and infrasound can penetrate the fabric of a building more easily than high and mid frequency noise, and partly because low frequency noise and infrasound can resonate inside a building, and so be at a higher level inside a building than outside a building.
5. Wind data needs to be collected both at the turbines (at hub height) and at the residences. This is necessary to take account of the wind speed ratio, i.e. the difference between the wind speed at the turbines and the wind speed at the residences. The difference can be considerable in hilly terrain, such that there may be high wind speed at the turbines, and little or no wind at the residences. This can happen on cold nights when there is a temperature inversion. The result is that the turbine noise at the residence is greater at night than during the day. (Appelqvist and Almgren, 2011; van den Berg, 2007; Thorne, 2011)

   Similarly, temperature data needs to be collected at both the turbines and the residences. This is necessary because it is possible for there to be no temperature inversion at the site of the turbines, if the turbines are set on a ridge, while there is a temperature inversion at the residences in the valley. This has been confirmed to me in a personal communication from Professor Frits van den Berg (van den Berg, 2011).

6. The collection of noise data needs to take account of "special audible characteristics", i.e. tonality and amplitude modulation. In some circumstances, these can lift noise levels well above any official limit. They are also more than usually annoying. (Bengtsson et al, 2004; Bradley, 1994)
7. In my discussion above of Items 1 to 4 I have proposed noise limits in terms of the descriptors L_{eq} and L_{90}. However, these descriptors, although conventionally used, are both unsatisfactory in different ways. L_{eq} is unsatisfactory because it time-averages the sound levels, and so does not reflect the peak levels actually heard by neighbours. L_{90} is unsatisfactory because it measures only the highest level during the quietest 10% of the time. This is a problem that may be insoluble. Independent noise engineers should be consulted. (Thorne, 2011; Hansen, 2010)

Item 6 Subsection 30 E (3) and Item 7 Subsection 30 E (3)

Item 6 omits "may" and substitutes "must". Item 7 omits "law of" and substitutes "law (whether written or unwritten) of or in force in".

The effect of these amendments is, first, to remove the Regulator's discretion as to the suspension of a power station's accreditation, and instead to make it mandatory for the Regulator to suspend accreditation, if the Regulator believes that the power station is being operated in contravention of a law of the Commonwealth, a State or a Territory; and, second, to make it clear that a power station's accreditation may be suspended if it contravenes any law (whether written or unwritten) in force in the Commonwealth, a State or a Territory.

The significance of these amendments lies in the fact that the Common Law tort of "private nuisance" falls into the category of "law (whether written or unwritten) of or in force in", since the Common Law is "unwritten", and exists only in judicial decisions.

These amendments are also very desirable, and indeed essential from the standpoint of wind farm neighbours, for the following reasons. At present, wind farm neighbours who have complaints of adverse noise and health impacts against a wind farm cannot obtain adequate redress of the grievance from the official compliance monitoring, and noise auditing procedures of the proponent, the Minister for Planning, or the Environmental Protection Authority, for reasons explained above. The only recourse that such neighbours have is to bring a civil suit under Common Law for private nuisance. This is the neighbours' only recourse because (i) under Common Law a defendant's claim that his development complies with its conditions of consent is not a defence in law against committing the offence of nuisance; and (ii) under Common Law a defendant's claim that his development is a public good is also not a defence in law against committing the offence of nuisance. (Ring and Webb, 2012)

A suit for private nuisance is the only way that a wind farm neighbour can take his complaint out of the context of the conditions of consent (based on totally inadequate noise guidelines), and out of the context of public good. Planning legislation and Environment Courts in Australia will protect developments from neighbours' complaints, however legitimate, by reference to (inadequate) conditions of consent, and the notion of the public good.

Consequently, neighbours have no hope of redress by appealing to an Environment Court, or to a Minister for Planning, or to an Environment Protection Authority, since these are all obliged to act in accordance with the planning legislation. The only hope for redress that neighbours have is the Common Law.

However, a civil suit for private nuisance may cost hundreds of thousands of dollars, since it will require not only solicitors and barrister, but also an array of expert witnesses to deal with the acoustic, meteorological, and medical issues, in order to prove the nuisance. Some of these experts may have to be brought from overseas. Costs will therefore include travel and accommodation, as well as the expert's fee for giving evidence.

In addition, if the case is ineptly handled, through no fault of the plaintiff, and judgment is given for the defendant, the plaintiff must pay the defendant's costs as well.

In sum, the wind farm neighbour may be unable to mount such a case, or may be bankrupted, if he does. This consideration will be enough to deter many neighbours from contemplating legal action, even if they have a legitimate grievance.

Once again, the pursuit of justice depends on wealth. This is fundamentally unjust.

So, it seems to be the intention of the bill that neighbours should be able to obtain redress from the Regulator without having to go to Court, with all the expense and risk that that would entail. This is very commendable.

However, how exactly will this desirable end be achieved? Will the Regulator make a decision as to whether the wind farm is creating a nuisance, based on the data published on the internet? Or, will the Regulator order an investigation by an independent noise engineer, to be funded by the operator or the government? In general, how is the Regulator to determine whether a nuisance has been created or not?

If the neighbour still has to go to Court to establish the nuisance, before going to the Regulator, then the apparent intention of the bill is subverted, and the neighbour's situation is not improved.

On the other hand, if the Regulator is only to consider whether the wind farm is creating "excessive noise", according to the definition of "excessive noise" in this bill, then this amendment (item 7) is unnecessary. The offence of "excessive noise" falls under statute law (this very Act), and not under unwritten law (i.e. Common Law).

The only point of amending the Act so that it refers to unwritten law is to render a wind farm liable to committing the offence of nuisance as well as the offence of excessive noise. Therefore, there must be some process by which the Regulator can determine whether the offence of nuisance has been committed or not. And, if neighbours are to be able to avoid the necessity of going to Court, then this process must be funded either by the operator or by government, and carried out by the Regulator.

All this remains unresolved, and indeed undiscussed in this amendment, so that even with this amendment, as it stands, the situation of wind farm neighbours is not improved.

Item 8 After subsection 30 E (4)

This item draws out the implications of the previous items and, therefore, should be supported.

Item 9 Application of amendments

Point (2) makes the application of items 5 to 8 retrospective, so that they apply to wind farms approved before the passing of this bill (if I have understood the matter correctly). This is very desirable. Otherwise, the neighbours of existing wind farms, and of those approved before the passing of this bill will not be advantaged by the bill. If they are suffering any adverse impacts, their suffering will continue.

Concluding remarks

It cannot be too much emphasised that some of the neighbours of existing wind farms in Australia are suffering adverse impacts (some being compelled to abandon their homes) because of a failure of planning at State level. State planning legislation does not concern itself with the needs of the neighbours of developments. And, the noise guidelines in use in Australia by State planning departments are completely inadequate to protect wind farm neighbours, being not in conformity with the best research of the last decade into wind turbine impacts.

The result is that some neighbours of existing wind farms in Australia are suffering adverse noise and health impacts, and some have been compelled to abandon their homes, because wind farms have been inappropriately located. The planning and assessment process predicts that there will be no adverse effects from a development, and the development is approved. But this approval can only occur because the modelling used to predict a safe outcome is based on false assumptions, and an inadequate view of the whole range of wind turbine noise impacts.

As more and more wind farms are built, under the same planning legislation and according to the same guidelines, more and more people in rural Australia will be adversely impacted. Rural Australia is facing a planning disaster on a grand scale.

The State governments are unlikely to change this situation. To do so would involve admitting that a planning failure has occurred. However, what is an even greater deterrent to any State government acting to resolve this situation is the threat of having to pay compensation to wind farm operators for revoking approvals. In this situation, both the Victorian and NSW State governments refuse to consider legislation to review approvals, or to institute a moratorium on construction. Neighbours already suffering adverse impacts, as at Cullerin, Capital, Woodlawn, Waubra, and Waterloo, must be left to themselves, with no redress from the State governments that originally approved the wind farms, and that approved them wrongly, as a result of a failure by their own State planning departments.

In this situation it is desirable that the Federal Parliament should act. If State governments will not act, the Federal Parliament, with its independent powers, must do so. The bill proposed by Senators Madigan and Xenophon is, in its general conception, very desirable, and should be supported. Its precise terms need to be improved, if wind farm neighbours are to derive real benefit from it.

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