Belinda Wehl

FEDERAL SENATE INQUIRY
into
EXCESSIVE NOISE FROM WINDFARMS
Bill to amend the Renewable Energy Act

Summary

I support the proposed amendments to the Renewable Energy Act.

I have been involved with trying to help people affected by wind farm noise, and those who maybe affected by wind farm noise in the future, for approximately 4 years.

I have spoken with people from many wind farms, both in Australia and overseas, who describe audible and inaudible noise that severely affects themselves and their families.

I have also spoken with acoustic experts and some from the wind farm industry, who I believe know that wind farms are causing harmful and excessive noise, but who hide behind out of date regulations and the desire of the community to have green energy.

Research and experience of existing wind farms lead me to conclude that turbines are sited too close to homes and workplaces. At many approved or constructed wind farms there are turbines up to 3MW only 800 metres from non-host land holders homes, with some homes completely surrounded by turbines.

I believe that our old guidelines were grossly inadequate in calculating audible noise. In Victoria we now have a liberal government and new wind farm guidelines that set distances between homes and turbines of 2km. Unfortunately many turbines were already approved or constructed with the old guidelines.

If wind farm operators and developers are faced with not receiving the renewable energy certificates I believe they will be more interested in residents concerns and more diligent in calculating noise levels.

AUDIBLE NOISE

My initial concerns regarding wind farms were based on audible noise. Many approved wind farms in Victoria were based on an acoustic standard that is 14 years old, NZS6808:1998 - The Assessment and Measurement of Sound from Wind Turbine Generators. This standard was written when turbines were only 45-50 metres hub height and around 700kW. (Blayney wind farm, NSW - 45 metre hub height, 660 KW motors). The turbines used now are up to 85 metres hub height and have up to 3MW motors.

The Swedish Environment Protection Agency study titled “Noise Annoyance from Wind Turbines – A Review” (page 10) found that common hub heights for operating turbines in Sweden were 40-50 metres. They state that the new turbines have a hub height of 80-90 metres, and note that the turbine wind speeds at these hub heights compared to the wind speed at ground might have been underestimated.

Note: a 10 dB increase in sound equates to double the loudness.

There are two factors that I believe contribute to the inaccurate calculation of audible noise, these are amplitude modulation and stable air.

Amplitude Modulation

Amplitude modulation is a special audible characteristic , which is often described as impulses or thumping. I believe that this characteristic should be regarded by guidelines as inherent to wind farms which would lead to a 5dBA penalty added to all predicted noise levels from wind farms.

Many recent studies (see references) have found that the noise complaints from existing wind farms are a result of amplitude modulation.

At a wind farm site where multiple turbines are in use, two or three turbines can be operating in phase. This is where the maximum noise level from each turbine is heard at the same time. When a number of turbines are in phase audible modulations (impulses or thumps) are created that can be heard over background noises some distance away.

There are a number of occurrences that can cause amplitude modulations. One is the blade passing the tower. A second is the movement of blades through different wind speeds, known as wind shear. Topography and multiple turbines are also factors.

Many experts agree that amplitude modulation is difficult to predict. A report “Research into Aerodynamic Modulation of Wind Turbine Noise : Final Report” by Department for Business, Enterprise and Regulatory Reform, UK, page 4, states that “*AM is not fully predictable at current state of the art.*” From the Swedish Environmental Protection Agency report, “Noise annoyance from wind turbines - a review”, page 9, states that “*the modulation in the noise from wind turbines is not yet fully explained and will probably not be reduced in the near future and is therefore a factor of importance when discussing noise annoyance from wind turbines*”. “Amplitude Modulation of Wind Turbine Noise. A Review of the Evidence”, by Dick Bowdler, also discusses the fact that AM is impossible to predict.

In “Amplitude Modulation of Wind Turbine Noise. A review of evidence” by Dick Bowdler, page 5, is an example of AM from G.P van den Bergs study “Do wind turbines produce significant low frequency sounds”. It states “*If we have two turbines whose sound modulates between a maximum of +3dB and a minimum of -3dB then, when the modulations are in phase, they will vary between a maximum of +6dB(which is a 3db higher pulse level) and a minimum of 0dB. When they are out of phase they will be more constant at a level of around +4dB. Similarly with three turbines in phase the sound will range from a maximum of 8dB (which is a 5dB higher pulse level) to a minimum of 2dB. When out of phase it will be a relatively constant 6dB*.”

From van den Bergs study, amplitude modulation can cause not only the annoying, pulsing sounds which appear 5dB louder, but also can increase actual noise levels by 3-5dB.

Amplitude modulation cannot be predicted and is a problem with turbines with high hub heights.

<u>Stable Air - van den Berg effect</u>
According to NZS6808:1998, Acoustics noise levels are to be measured at homes near wind farms sites and wind speeds are measured 10m from ground level. From the recorded wind speeds noise levels from the wind farm are predicted. Predicted noise levels must not exceed the noise levels recorded near homes by more than 5dBA or 40dBA, which ever is the greater value.

The Van den Berg effect is the result of a study by G.P. van den Berg at an existing wind farm in Rhede, Germany that experienced noise complaints. On quite nights it was found that the turbines could rotate at high speed, resulting in the wind farm being heard several kilometres away. This effect is caused by stable air flow, when the wind at ground level (where most background measuring is collected at 10 metres above ground) is moving slower than the air at hub height (85 metres above ground). Stable air occurs at night, which increases the listener’s annoyance due to difficulty sleeping and less background noises.

At daytime, the air is mixed by turbulence resulting from friction with the earth, especially from the thermal turbulence resulting from the heating of the earth by the sun. At night there is radiative cooling of the earth, which results in atmospheric stability. This causes the wind to subside. When the cooling begins, wind speed at ground level is reduced. However, wind speeds at hub height can still be relatively high.

A logarithmic relationship between wind speed at height and wind speed at a reference height, normally 10 metres, is commonly used but it has no consideration of atmospheric stability. Therefore it does not adequately predict wind profiles at night. From page 4 of van den Bergs article “Effects of the wind profile at night on wind turbine sound”, “*The effect of the change to stable atmosphere is that, relative to a given wind speed at 10m height in daytime, at night there is a higher wind speed at hub height and thus a higher turbine sound power level; also there is a lower wind speed below 10m and thus less wind-induced sound in vegetation.*”

In the article by G.P. van den Berg based on the study at Rhede, it states that the wind speed at hub height at night can be 2.6 times the expected wind speed, which can result in higher rotation speed of the turbines and sound levels up to 15dB higher than predicted.

When there is stable air there is low background noise levels but high noise levels from the turbines as described above, and therefore the background noise fails to mask the noise from the wind farm.

The van den Berg effect has been found to occur in areas with a roughness of 3cm, which is defined as undulating paddocks with occasional crops of trees.

An article from the Bureau of Meteorology titled “Wind Shear” discusses both stable air and wind shear. It states that wind shear is due to friction and the closer to ground surface the slower the wind speed.

The article also states that differences in wind speed due to change in height can range from very little in unstable air (around 5%) to enormous amounts in stable air (up to 300%).

From Acoustic Assessment of Wind Farms – A Practical Perspective, by Peter and Rachel Foster, page 2 states that "*some sites may show variations in the vertical wind profile or shear between day and night (eg. due to greater atmospheric stability at night compared to day). In addition, the site wind profile (and terrain roughness) may be different to that at the initial turbine sound power measurement site"*. They state that this may lead to errors in the "*assumed turbine sound power level versus wind speed*" at the site and that it is "*important to define the inherent wind profile at the proposed wind farm site".* From this we can see that referencing the wind speed at hub height is not good enough, an investigation into the wind profile is a must.

Further, they recommend that with regard to the lack of "hard data" regarding stable wind in Australia, measurement of wind speed at heights approaching hub height in conjunction with the 10m AGL measurements to "*enable informed decisions*" on this effect.

While it is not for use , the Draft Australian Standard, DR 07153 CP, "Acoustics – Measurement, prediction and assessment of noise from wind turbine generators" does give us further reason to believe that stable air should be investigated. On page 9 it states that the use of 10m AGL wind speed may result in increased uncertainty in the estimation of actual sound power levels, particularly in stable air.

Often in reports to planning panels, wind farm proponents acoustics report on state that "hub height wind speed data was not available at the time of the noise monitoring. Therefore, wind speed has been measured at 10m above ground level (AGL)" Acoustic experts for wind farm proponents often state that NZS6808:1998 does not discuss stable air and therefore they do not have to investigate this effect. That the guidelines do not address stable air should be of little consequence, experts agree that this effect occurs therefore it must be investigated.

<u>Questions regarding NZS6808:1998</u>
Marshall Day Acoustics (often used as expert noise witnesses by wind farm proponents) state in their report on the proposed Moorabool wind farm that the "*noise predictions in NZ6808:1998 are based upon a simple equation that may be conservative...*" – page 9. This contradicts a report by Marshall Day Acoustics titled "Wind_farm_noise_in Australia ©_Marshall_Day_Acoustics_2004" (see Appendix A) which states:
"NZS6808 also details a simple method of predicting noise levels at various distance from the turbines"
"The method was always considered conservative as it ignored any ground absorption and topographical shielding"
"As the turbines have grown in size the method is no longer conservative as the low frequency noise content is greater and the model under predicts"

<u>Noise Monitoring</u>
From the recently approved Moorabool wind farm, the background noise monitoring was not undertaken in accordance with NZS6808:1998. However the panel still granted the permit. From Moorabool Wind Energy Facility Panel report: September 2010:

6.5.14 Conclusions and Recommendations – Adequacy of Noise Assessments Provided
It is concluded that:

The noise assessment provided with the Application as modified by the evidence presented to the Panel does not satisfy the requirements of the Planning Scheme and the WEF Guidelines because:

- A prediction of compliance with the noise limits specified in NZ6808:1998 is not provided; and
- The assessment has not been completed in accordance with the WEF Guidelines and NZ6808:1998 in relation to:
- The selection of locations for measurement of background sound levels;
- The positioning of noise monitoring equipment relative to that of trees and vegetation; and
- Anomalous background sound level and wind speed data at one location.

How can a permit be granted when guidelines are not met and calculations need to be redone?

Noise monitoring prior to wind farm construction is often inadequate and results in the difference between noise from turbines and back ground noise being a lot higher than allowable. If noise monitoring does not record lower levels of noise (due to inadequate equipment) when background noise monitoring is being carried out, then the average background noise levels are a lot higher than actual.

This means that allowable noise levels that are calculated by acoustic experts are higher than they should be. And this results in distress to residents.

For these reasons we need proper noise monitoring and real action when wind farms are emitting noise levels above those that are acceptable.

Homes surrounded by turbines
Some houses at the constructed or approved wind farms are be surrounded by turbines. These are non host land holder properties.

Residents of these properties will hear wind turbine noise every time the wind blows due to the properties being for the most part surrounded by turbines.

The report "Bald Hills wind farm project: EES, EES supplement and called-in permits, Panel report: 24 June 2004", page 193 stated that, referring to problems with the Toora wind farm, the panel '*should seek to learn such lessons as can at this stage be learned from previous case*s'. Further, it states, on page 202, '*no dwellings located as at Toora, at short range, with turbines surrounding them such that almost any wind direction will deliver down wind turbine noise, with little relief. …The Panel would suggest that such siting vis a vis dwellings is now beginning to appear somewhat unwise, and on a precautionary basis to be avoided.*.

We now have the case of the Godfrey's whose property at the Waubra wind farm was surrounded by turbines. They complained about noise levels, health problems, blade flicker and impacts of the aviation lighting. Their property has since been bought by the wind farm operator. While the wind farm operator stated the property was bought due to the "visual impact of turbines on their property" we cannot ignore the fact that the problems the Godfrey's were concerned about were **health** and **noise**.

Problems at Existing Wind farms
The following are by no means the only wind farms where residents experience noise and health problems.

Mr & Mrs Davis – Lincolnshire, England
At the Second International Meeting on Wind Turbine Noise, in Lyon France, September 20-21, 2007, Julian and Jane Davis presented their experience with a neighbouring wind farm. The wind farm consists of eight 100 metre tall 2MW turbines. The closest turbine is 930 metres away. Their account highlights the consequences of siting turbines too close to homes.

They discuss the pulsing nature of the noise and document their sleep deprivation, and other effects on their living. These include influence on the ability to enjoy the amenity of their home, health issues, loss of property value, concentration difficulties, and the affect on their cognitive ability, social life and moods.

Toora Wind Farm
Toora Wind Farm, in the South Gippsland Shire, was commissioned in 2002. Since that time noise has become a significant issue to those who live near the wind farm, and a number of properties have been bought by the wind farm company. Properties have since been demolished.

Residents have stated that it was not so much the loudness of the noise that they had problems with, but the character of the noise, ie the pulsing, thumping noise.

Media release – Victims of Industrial Wind Turbines on the Rise in Ontario 2009
- This release reports an increasing number of people in Ontario reporting adverse health affects due to wind turbines.

- Release states that more suffers may not be coming forward due to non-disclosure agreements in their contracts with the wind farm operators.

- Complaints include sleep disturbance, inner ear problems, cardiac arrhythmias, headaches and mood disturbances. Some have had to leave home.

- The release asks for independent monitoring of sound levels using both dBA and dBC, the frequency of the sound, and exposure time.

Waubra Wind farm.
- A number of families have moved out of their home due to low frequency noise. This low frequency noise causes pressure build up in the head and a number of health problems. They are unable to work on their property. Turbines 1.3-3km away from their home.

- Many families have trouble sleeping at night. They say the turbines can sound like jets over the house.

- One family used to go to sleep wearing head phones but were still woken every night by the turbine noise. They could hear the turbines every time the wind blew. They were surrounded by turbines, the closest turbines is approximately 800 metres away. They also experienced shadow flicker. House now bought by wind farm operator.

- Many residents describe feeling pressure in their head, pain behind their ears, blood pressure problems, dizziness, nausea, unable to work for long periods outside,

- Many homes have now been bought by Acciona and other homes are empty as families have had to leave the area for the sake of their health.

Capital Hill Wind farm
See articles from Sydney Morning Herald titled "George in a spin over noisy wind power", September 21, 2009. and "Tilting at wind mills: why families are at war", April 2, 2010

- Resident describes sound like "having a washing machine running constantly, or car idling outside your window, or an aircraft overhead which stays in one position…it is a constant drone which is quite disturbing"

- Another resident describes "it's as loud as an aircraft overhead, but there is also a "whoomp, whoomp, whoomp" regular sound with the blades passing the stem". When the blades turn on frosty nights they also "hear a high-pitched sound as well."

Summary of Recent Research on Adverse Health Effects of Wind Turbines, October 2009.
This paper discussed recent peer-reviewed research which substantiate adverse health claims in relation to wind farms.

- Ontario - as of September 2009 98 people reporting adverse health affects from wind farms. Some families have left their homes, page 9

- Health Canada states that "there are peer reviewed scientific articles indicating that wind turbines may have an adverse impact on human health.", page 9

- States on page 10 that "Like the wind industry today, the tobacco industry denied for many years that there were any adverse health effects from their products. Corporate denial of a health problem is generally a delaying tactic not in the best interest of the public."

- Minnesota Department of Health, page 11, "conclusion noted that wind turbines generate a broad-spectrum of low-intensity noise. The low frequency may affect some people in their homes, especially at night."

Dr Christopher Hanning, page 11, "In weighing the evidence, I find that, on one hand, there is a large number of reported cases of sleep disturbance and, in some cases, ill health as a result of exposure to noise from wind turbines, supported by a number of research reports that tend to confirm the validity of the anecdotal reports and provide a reasonable basis for the complaints. On the other, we have badly designed industry and government reports which seek to show that there is no problem. I find the latter unconvincing." (Dr Chris Hanning is a retired NHS sleep disorder specialist, he was the director of the Sleep Disorders Clinic at Leicester General Hospital.)

- Further of page 12, Dr Hanning states, "In my expert opinion, from my knowledge of sleep physiology and a review of the available research, I have no doubt that wind turbine noise emissions cause sleep disturbance and ill health."

- Dr Hanning, page 12, "families whose homes were around 900m from wind turbines found the noise, sleep disturbance and ill health eventually drove them from their homes."

- Dr Hanning, page 12 "inadequate sleep has been associated not just with fatigue, sleepiness and cognitive impairment but also with an increased risk of obesity, impaired glucose tolerance (risk of diabetes), high blood pressure, heart disease, cancer and depression. Sleepy people have an increased risk of road traffic accidents."

- Dr Michael Nissenbaum (USA) ,"symptoms (including sleep disturbance, headaches, dizziness, weight changes, possible increases in blood pressure, as well as increased prescription medication use), all appear to coincide with the time when the turbines were first turned on."page 13 (Radiologist in Maine, in radio interview quotes residents as saying "nobody will help us, cant leave here, cant live here. See http:/vodpod.com/watch/2060980-interview-with-dr-s-micheal-a-nissenbaum)

- Page 13, In Japan in February 2009, 70 adverse health effects were reported due to wind farms. “Bouts of dizziness and inability to sleep properly were reported. When victims spent time away from the house, the symptoms quickly dissipated. But as soon as they returned, they would flare up again”, page 14

- Page 14, Ontario, “Sleep disturbance is the most common complaint. Other symptoms include inner ear problems, cardiac concerns such as arrhythmias and palpitations, headaches and cognitive and mood disturbances. Several suffered acute hypertensive episodes which are most concerning. Some have had to leave their homes in order to protect their health”

- On page 15 they discuss the effects of wind turbines on animals.

- Page 16 discusses Shadow Flicker

INAUDIBLE NOISE - LOW FREQUENCY NOISE OR INFRASOUND

In the couple of years I have begun to realise that wind farms also cause health problems due to inaudible noise - low frequency noise or infrasound. I have met people from Waubra wind farm and other areas and are very concerned for their well being. I believe that low frequency noise requires immediate attention from our government and even the above setbacks for audible noise appear to be inadequate.

I believe that the standards are inadequate as they does not include low frequency noise. Noise measurements in NZS6808:1998 are in dBA, which is noise that the average health adult can hear.

Graeme Hood from Ballarat University conducted preliminary testing at various properties at the Waubra wind farm over a year ago after residents experienced effects such as dizziness, ear ache, nausea etc. Sound pressure testing revealed low frequency noise between 70-80 dB, even though the A-weighted (audible noise) reading was only 20dbA.

The World Health Organisation Guidelines for Community Noise, by Berglund et al. states on

- “a large proportion of low-frequency components in noise may increase considerably the adverse effects on health”, page xiv

- “Special attention should also be given to the following considerations: c. Sound with low-frequency components. Disturbance may occur even though the sound pressure level during exposure is below 30dBA., page 28

- “When prominent low frequency components are present, noise measures based on A-weighting are inappropriate”, page 28

- Since A-weighting underestimates the sound pressure level of noise with low frequency components, a better assessment of health effects would be to use C-weighting.” page 28

- “The evidence on low frequency noise is sufficiently strong to warrant immediate concern”page 28

As stated earlier, from the Marshall Day Acoustic presentation titled Wind farm Noise in Australia, 2004

- “As turbines have grown in size the method is no longer conservative as the low frequency noise content is greater and the model underpredicts.”

A paper titled Infrasound and its Effects on Humans by Diana Carolina Fernandez Valencia, Faculty of Architecture, Design and Planning, University of Sydney describes a study in the UK where music was played to an audience with infrasonic sound (frequency of 17Hz) introduced in two of the musical pieces without letting the audience know it was there. Results showed “emotional and physiological responses such as anxiety, headache nausea, and increase in heart beat”. (section 5.1)

A similar study was conducted in Sydney, with a 19 Hz low frequency stimulus (sound pressure level of up to 83dB) played at the same time as music. The results after just 10 minutes of listening to both the infrasound and music are as follows.

After 10 minutes of listening to both the infrasound and music. “36.4% of the population felt no physical sensation nor differences among parts of the experiment. The remaining 63.6% described the effects on their body when the stimulus was on with words such as “pain on the left side above the ear”, “difficulty to focus”, “hurting joints”, “change in body pressure”, “sensation of illness” and “pump in blood pressure”

among others." (section 5.2.2)

These effects are similar to those experienced by Waubra residents and those living near other wind farms.

A Review of Published Research on Low Frequency Noise and its Effects, Dr Geoff Leventhall, 2003

- Page 32, "Twenty subjects compared the two noises within the dynamic range 49-86 dBA. At equal A-weighted levels, the noise dominated by the low frequency component was perceived as 4-7dB louder and 5-8dB more annoying.

- Page 32, "Nakamura and Inukai used a stimulus sound of a pure tone in 20 conditions from 3Hz to 40Hz and pressure levels from 70dB to 125dB, with evaluation by 17 subjects. There were four main subjective factors in response to low frequency noise: auditory perception, pressure on the eardrum, perception through the chest and more feeling of general vibration."

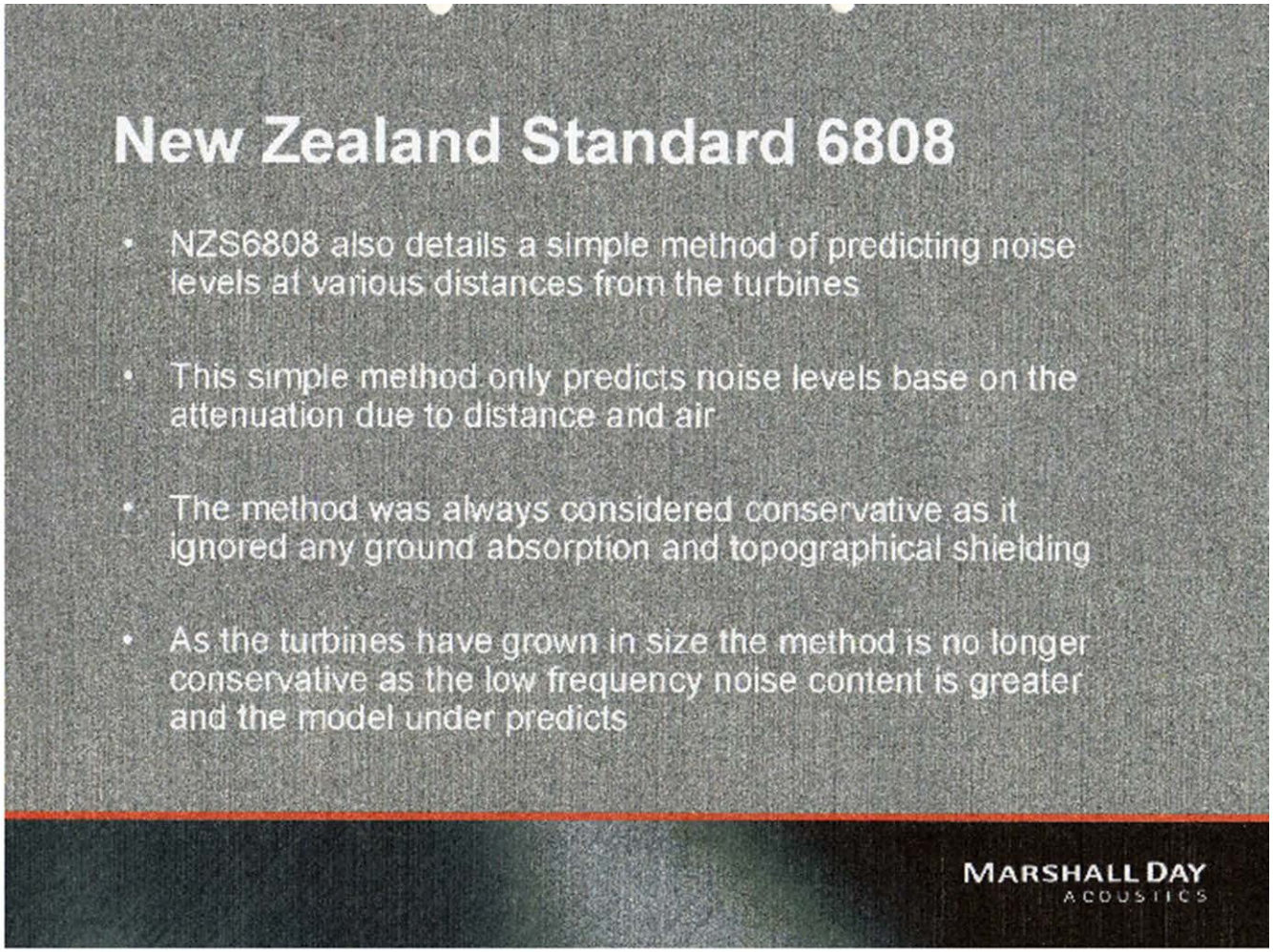
- Page 34, The difference between C- and A- weighting's of greater than 20dB is a predictor for a low frequency noise problem.

Conclusion

Many rural residents are suffering from the effects of audible and inaudible noise due to wind turbines too close to their homes. With thousands of wind turbines have been proposed or approved across this country many, many more are facing the same situation

I have met decent, genuine people who have been forced out of their homes, or who continue to live in their homes while suffering from serious health problems. I have also met or spoken with people facing a similar fate. Many are worried. Some speak out and many more are quite. Many people move to rural Victoria to get away from the rat race and can not cope with planning panels and the like.

I thank Senators Xenophon and Madigan for listening to people who are suffering. I believe that wind farm operators and wind farm developers will be more diligent if there is a possibility of not receiving renewable energy certificates and that excessive noise levels due to inadequate noise calculations and inappropriate siting of turbines can therefore be reduced.


New Zealand Standard 6808
• NZS6808 also details a simple method of predicting noise levels at various distances from the turbines
• This simple method only predicts noise levels base on the attenuation due to distance and air
• The method was always considered conservative as it ignored any ground absorption and topographical shielding
• As the turbines have grown in size the method is no longer conservative as the low frequency noise content is greater and the model under predicts
MARSHALL DAY
ACOUSTICS

REFERENCES

Studies in relation to Amplitude Modulation and the van den Berg Effect

1. "The measurement of Low frequency noise at three UK Wind Farms', by Hays McKenzie "Wind Turbines and Infrasound" – Canadian Wind Energy Association, Nov 2006
2. "Noise Annoyance from Wind Turbines – A Review", Swedish Environment Protection Agency. August 2003
3. "Effects of the wind profile at night on wind turbine sound", G.P.van den Berg, Jan 2003
4. "Wind turbines at night: acoustic practise and sound research", G.P.van den Berg. 2003
5. Research into Aerodynamic Modulation of Wind Turbine Noise – Final report", Moorhouse, M and Von Hunerbein, S and Piper, BJ and Adams, MD, 2007. Technical report, Department for Business, Enterprise and Regulatory Reform, UK
6. Amplitude Modulation of Wind Turbine Noise", Dick Bowdler. Published in Institute of Acoustics Bulletin Vol 33, no.4, UK

Other references

7. Bald Hills wind farm project: EES, EES supplement and called-in permits, Panel report: 24 June 2004
8. Draft Australian Standard, DR 07153 CP, Acoustics – Measurement, prediction and assessment of noise from wind turbine generators, March 2007
9. New Zealand Standard 6806:1998 – Acoustics – The assessment and measurement of sound from wind turbine generators
10. Wind Shear, Bureau of Meteorology, 2008. www.bom.gov.au/weather/nsw/amfs/wind%20shear
11. Wind_farm_noise_in Australia ©_Marshall_Day_Acoustics_2004, Marshall Day Acoustics
12. Peer Review, Kaiwera Downs Wind Farm Noise for Gore District Council, Nigel Lloyd, Acousafe, Feb 2008
13. Second International Meeting on Wind Turbine Noise, September 2007. Abstracts, page 10
14. Oberon Council Development Control Plan, Part O, Wind Generation, 2005
15. Glen Innes Severn Development Control Plan, Wind Power Generation, May 2008
16. Upper Lachlan Shire Council Development Control Plan, Wind Power Generation, September 2005
17. Report on the Second Meeting on Night Noise Guidelines, World Health Organisation. "Noise pollution from wind turbines - Living with amplitude modulation, lower frequency emissions and sleep deprivation", Jane & Julian Davis
18. Guidelines for Community Noise, World Health Organisation
19. Second International Meeting on Wind Turbine Noise, in Lyon France, September 20-21, 2007
20. Peer Review, Mahinerangi Wind Farm Noise for Clutha District Councilm Nigel Lloyd, Acousafe, April 2007.
21. Acoustics Assessment of wind farms – A practical perspective, Peter Teague and Rachel Foster, Nov 2006.
22. Lal Lal wind farm panel report - Lal Lal Wind Energy Facility Permit Applicaion PL-SP/05/0461 and Native vegetation removal permit application PL07/067 Panel Report, February 2009
23. Summary of Recent Research on Adverse Health Effects of Wind Turbines, 20 October 2009
24. Rural wind farms, Legislative Council, General Purpose Standing Committee No. 5, 31 December 2009
25. Moorabool wind energy facility permit application 2009012877, Panel Report, September 2010.