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September 4, 2013

Commissioners Wright and Liston
VCAT
55 King Street
Melbourne Vic. 3000

Dear Commissioners,

The following information is provided to you, in response to your request for further information to enable you both to make an informed decision about the risk to health posed by the proposed Cherry Tree Wind Development.

You identified that the lack of overlap in expertise between health practitioners and acousticians has hampered progress in understanding these links, so we are delighted that Dr Bob Thorne, a psychoacoustician with expertise in both health and acoustics as well as seven years research experience investigating the effects of wind turbine noise on humans has agreed to assist the Commissioners with their deliberations. Dr Thorne has provided a number of recent peer-reviewed published papers, and an encyclopaedia chapter via the Trawool Landscape Guardians and has offered to make himself available to the Tribunal for questioning. In your orders, the following questions were posed:

1. Is there a **causal link** between wind turbine emissions and health problems? (ref para 127). Related to this issue is the hypothesis concerning the existence or otherwise of a “nocebo effect”
2. You then asked what is the **incidence** of problems within the population, and how does that attenuate with distance? (ref para 129)
3. You also requested information about the **distance of the adverse effects**, with particular reference to the experiences of people living out **beyond 2km** from the nearest wind turbine (ref para 130).

Since your orders were handed down, there have been some significant advances in new knowledge, and rediscovery of old research which is highly relevant to the questions posed above. This letter will provide a “road map” through that research, and the documents are attached.

Unfortunately neither the NHMRC Literature Review, nor the SA EPA acoustic survey results are yet available for your consideration, nor has the SA EPA or the wind developer made the requested data available to the acousticians collecting data at Waterloo concurrently but independently of the South Australian EPA.

Evidence to support direct causation of symptoms

Old American research

Old research from the USA, commissioned by the US department of Energy, and led by Neil Kelley (Kelley 1985) – the principal scientist with the Solar Energy Research Institute, **established in 1985 that wind turbine acoustic emissions in the infrasound and low frequency noise range were directly causing the annoyance symptoms for some residents 3km away from a downwind designed 2MW wind turbine.**

This was extremely significant research, and resulted in a change in design to the upwind bladed “modern” turbines today, because of the problems with wind turbine noise and consequent “annoyance”. The researchers established maximum operating parameters for the different sound frequencies in the infrasound and low frequency noise ranges, which can be found on page 225 of the 1985 Kelley report.

*“the joint radiation levels (expressed in terms of acoustic intensity and measured external to a structure) in the 8, 16, 31.5 and 63 Hz standard (ISO) octaves **should not exceed band intensity threshold limits of 60, 50, 40 and 40 dB (re 1 pWm⁻²) more than 20% of the time.** These figures compare favourably with a summary of low-frequency annoyance situations by Hubbard [32].”*

The Hubbard research (Hubbard 1982) referred to previous work done determining sound frequencies and doses resulting in annoyance for residents from sound energy from other sources which resulted in building vibration. The consistency of the results added weight to the evidence of a direct physiological effect, and the reproducibility of the effects across different noise sources, ensuring the results were grounded in existing known science.

Subsequent laboratory research (Kelley 1987), which reproduced the sound energy in a laboratory and induced the symptoms of annoyance in a group of volunteers, which was directly related to the impulsive nature of the sound, further confirmed that the wind turbine sound energy emissions were the direct cause of the symptoms.

That laboratory research (Kelley 1987) was presented at the 1987 Windpower conference in California, so the wind industry were well aware of it and its significance.

It is inexplicable on the grounds of public health for this information to have been ignored for the next 25 years. However if it is understood that globally wind industry acousticians have “assisted” with the writing of wind turbine noise regulations, it becomes clearer as to why these infrasound and low frequency noise frequencies have been omitted from the existing wind turbine noise guidelines, and why the “safe” operating parameters established over 25 years ago have never been implemented or regulated.

This US research in 1985 helped establish what are effectively “dose response” relationships and maximum tolerable limits which was precisely the sort of research suggested by the Australian Federal Senate Inquiry in 2011. Predictably the wind industry lobby group, the Clean Energy Council, have said that this research is not relevant to existing modern wind turbines, but Neil Kelley has confirmed with Australian Journalist Graham Lloyd and American acoustician Robert Rand that the research is very relevant for today’s modern upwind bladed wind turbines.

Other evidence of direct causation

- Previously submitted case study by Professor Con Doolan of one resident at Waterloo whose annoyance symptoms directly correlated with the occurrence and the “dose” of measured noise inside her home. It was not possible to definitively show the noise came from the wind turbines because the developer refused to cooperate with the on-off testing required.

- “Case series cross over” design of the study by Dr Nina Pierpont provides one of the strongest forms of epidemiological evidence available, where people are their own controls and the only variable that changes is the exposure to operating wind turbines.
- This “case series cross over” design is the way Mary Morris has presented her new data from Waterloo (see below). It shows a direct correlation between exposure to operating wind turbines and symptoms in a range of ages, out to 8km from the Waterloo wind development. Her study is attached.
- Dr Paul Schomer, Director of Acoustics Standards in the USA and highly regarded acoustics researcher has identified that for a small subgroup of people with pre-existing motion sickness, who rapidly develop nausea and vertigo, that the wind turbine generated infrasound directly causes their symptoms via disturbance of the inner ear. He came to these conclusions independently of knowledge of Dr Nina Pierpont’s work, but they concur with her own findings. His paper has just been presented at the international wind turbine noise conference in Denver, and is attached. His paper does not explain the bulk of the problems with sleep deprivation, but he does provide evidence of direct causation of other symptoms.

The Nocebo research – the counter to evidence of “direct causation”

Unfortunately no medical or epidemiological research yet been conducted in Australia by any health or public health academics, with the exception of the research submitted to the Tribunal by Infigen, authored by Professor Simon Chapman, which relied heavily on research from New Zealand by Ms Fiona Crichton, both asserting support for the “nocebo” hypothesis which is essentially that the publicity about the symptoms is itself causing them rather than the sound energy.

The nocebo hypothesis ignores the longstanding and recent acoustic and clinical peer-reviewed published research relating to adverse health effects from chronic sleep deprivation and chronic stress, and the relationship between low frequency noise and “annoyance”, itself an acknowledged adverse health effect. The Crichton and Chapman research papers both use indirect data, avoiding direct interaction with residents living near existing wind developments. Crichton and Chapman then extend their hypothesis to residents living near wind developments but do not bother to check its validity and robustness “in the field”.

The Crichton and Chapman research has been heavily criticised by leaders in their fields internationally, and copies of each of those critiques are attached, by Swinbanks (acoustician), McMurtry (medical practitioner), Punch (audiologist), and Hartman.

The Waubra Foundation have also analysed a subset of data from the Chapman research and compared it to direct field evidence collected by an independent community researcher from an anonymous population survey at the Cullerin wind development in NSW. The critical analysis and comparison between Chapman’s data and the Cullerin population survey of complaints is also attached. It is clear there are numerous fatal flaws in this nocebo hypothesis with respect to the symptoms experienced by wind turbine residents.

Incidence of problems in the population living near large wind turbines

There is no international data relating to population surveys of noise impacted residents living near wind turbines of the size being used currently by wind developers in Australia.

Previous evidence submitted to the Commissioners was collected by Adelaide University Masters Student Frank Wang from Waterloo, who found that of the households within 5km who responded (64% response rate) half of them described being moderately to severely impacted by the noise.

The only other population data with meaningful response rates has been collected by Mrs Patina Schneider at Cullerin. The August 2012 Cullerin Range population survey was attached to my previous statement, and the July-August 2013 Cullerin Range survey by Mrs Schneider is attached.

This recent survey is consistent with the previous Cullerin survey, with a high response rate (68.5%) in the population out to 10km, with 83% impacted by noise and vibration, all of whom had complained to various authorities including the health and planning authorities, with no resolution of the problems.

The Cullerin wind turbines have been operating since 2009, and are only 2MW, much smaller in power generating capacity than the Vestas V112's proposed for Cherry Tree. It is to be expected that the numbers of affected people will increase over time, because people become sensitised to the sound, and the chronic effects of sleep deprivation and stress start to have more of a negative health impact over time.

The "sensitisation" phenomenon has been known to acousticians for many years, and was specifically mentioned in the rediscovered 1985 Kelley research paper in section 8.0 on page 199. Professor Leventhall also mentioned it in his 2003 report for DEFRA, previously submitted to the tribunal. It is significant for planning purposes, because it means that an even more generous buffer distances are required to protect health in the longer term, because over time more and more people will become impacted and once impacted the only way they will regain their health is to move away from the sound energy. They do not "get used to it". Professor Leventhall made this point explicitly in his 2003 DEFRA report, in his concluding remarks on page 60, where he states that "*if further exposure is avoided they may expect to become symptom free*".

Distance of Adverse Effects

The most useful recent information for the Tribunal members relating to the impact of V112 3MW wind turbines and the distance of their effect after operating for less than a year is from the preliminary survey recently conducted by Mrs Anne Schafer at Macarthur.

As a population survey the numbers were not sufficient to be meaningful. The low response rate was probably compounded by the existence of two large proposed wind developments to the north, the east and the south of Macarthur wind development, containing numerous participating resident stakeholders (future turbine hosts) which may have affected the participation rates.

However it is clear that many people in the vicinity of the Macarthur wind development beyond 2km are adversely impacted already by its operation. 66% of responding households were affected, and of those, 100% were adversely affected at night, out to a distance of 8-9km. 96% of the households were affected during the daytime, and 91% described negative health impacts. ***Almost half of those households affected (46%) lived between 2 and 5km*** i.e. outside the current Victorian Government "buffer zone" indicating that 2km is a completely insufficient distance in order to protect people when larger wind turbines are used. Macarthur is on flat land, and it is to be expected that turbines on hills will result in sound propagation out to greater distances. I strongly recommend the Tribunal members read that report in its entirety, including the comments.

Mrs Schafer is happy to attend the Tribunal to be cross examined on her report and data collection.

Mrs Mary Morris's first survey previously submitted to the tribunal and her previously mentioned follow-up case series cross over data contain data indicating impacts out to 8 – 10km from the VESTAS V90 turbines at Waterloo.

Mrs Schneider's two population surveys at Cullerin (2012 and 2013) indicate there are impacts out to between 7.5 and 10km which are affecting people's sleep.

Acoustic evidence of ILFN out to 10km

- There is a 1985 research paper by Willshire (NASA, attached) reporting that infrasound from a wind turbine was measured out to 10km. Clearly knowledge about this distance of sound energy propagation in the very low frequencies is not new.

- Steven Cooper has measured the characteristic wind turbine signature at a home 8km from the nearest wind turbine at a time when both he and the resident could perceive the low frequency noise. That resident has disturbed sleep which correlates with exposure to operating wind turbines and certain wind directions and weather conditions. That was reported in Mr Cooper's paper "Are wind turbines too close to communities" previously submitted to the Tribunal.
- Professor Colin Hansen in his letter to the Victorian Health department stated that under certain wind and weather conditions it was possible for significant numbers of people to be affected by the infrasound and low frequency noise from the Waterloo wind turbines.

Other matters - comments on the Victorian Health Department report

We note the Victorian Health department released a report by an unnamed author within the Health department. The qualifications and experience of the author(s) are unknown, as are any potential conflicts of interest, nor is there any evidence of a rigorous peer review process prior to it being issued by the Health department. The report was essentially denying the existence and the evidence of adverse health effects from wind turbines, and in particular from the effects of infrasound, and it failed to acknowledge the existing scientific evidence with respect to infrasound and low frequency noise.

The reference list is inadequate, has a preponderance of literature prepared by acousticians and others working closely with the wind industry, fails to mention important publications on noise and health from the World Health Organisation and the 2004 En Health report by Australian public health noise experts, and fails to adequately and objectively evaluate the existing peer reviewed published research in the fields of infrasound and low frequency noise and the known physiological effects.

The Victorian Health report of unknown authorship but dubious quality and clear bias is in stark contrast to the Arra and Lynn Literature Review from Ontario, the Powerpoint presentation of which was submitted to the Tribunal during Dr Black's evidence. You will no doubt remember that that review found that all the peer-reviewed published studies showed evidence of what Drs Arra and Lynn called "human distress". Unlike public health "experts" in Australia, many of whom are not trained medical practitioners, Dr Arra and Dr Lynn are public health medical practitioners, working at the coal face in rural Ontario, and have become very aware from both sick residents and their treating doctors of the range of health problems being experienced by these residents living near wind energy facilities in Ontario.

The Victorian Health report was strongly criticised by a leading Australian acoustics researcher Emeritus Professor Colin Hansen, the only recipient of an ARC grant to study wind turbine noise. It was also strongly criticised by Professor Alec Salt, the leading international neurophysiologist working in this area examining the effects of infrasound on the inner ear. Both those letters are attached.

No direct investigation by the Victorian Department of Health

We note that despite many requests from local councils (e.g. Pyrenees Shire Council) and sick residents at a growing number of wind developments, the Victorian Health department and in particular the Chief Health Officer are still refusing to come and investigate the residents circumstances "on the ground" despite being made well aware of the severity of the symptoms by the residents, and the fact that residents are having to leave their homes in order to obtain relief from the effects of the wind turbine sound and vibration energy.

Vulnerable citizens such as the elderly and the very young are being particularly adversely impacted, with some families having temporarily or even permanently left their homes as a result, especially at the Macarthur wind development, *with V112 wind turbines the same size as those proposed for Cherry Tree.*

Inadequate wind turbine noise guidelines

This problem has become even more obvious with the "rediscovery" of the old US government funded research (Kelley 1985 and 1987)

The current noise pollution guidelines are clearly inadequate to protect people, because they do not include measurement and regulation of either infrasound or low frequency noise, and in addition they are not being properly, continuously and independently regulated.

Mr Peter Mitchell prepared some comments about the NZ guidelines some time ago, and those documents are attached.

Mr Les Huson, independent acoustician wrote a paper critiquing the NZ standard, and that is also attached, for your reference.

We are happy to answer any queries you may have about any of the material submitted.

Yours sincerely



Sarah Laurie, CEO

Documents referenced in this letter

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<http://waubrafoundation.org.au/resources/review-published-research-low-frequency-noise-leventhall/>

Schafer, A 2013 Preliminary Survey Report for Macarthur Wind Energy Facility

Willshire, W (1985, NASA) <http://waubrafoundation.org.au/resources/nasa-long-range-down-wind-propagation-low-frequency-sound/>

Cooper, S “Are wind farms too close to communities?” previously submitted

<http://waubrafoundation.org.au/resources/are-wind-farms-too-close-communities/>

Hansen, C Letter to Victorian Health Minister re Victorian Health Department report

<http://waubrafoundation.org.au/resources/prof-colin-hansen-writes-victorian-dept-health-recent-wind-farms-health-doc/>

En Health 2004 “the Health effects of Environmental Noise, other than hearing loss”

<http://waubrafoundation.org.au/resources/health-effects-environmental-noise-other-than-hearing-loss/>

Arra & Lynn 2013 “Association between wind turbine noise and human distress” previously submitted

<http://waubrafoundation.org.au/resources/association-between-wind-turbine-noise-and-human-distress/>

Salt, A Letter to Victorian Health Minister re Victorian Health Department report

<http://waubrafoundation.org.au/resources/prof-alex-salt-expresses-deepest-disappoint-victorian-dept-health-report/>

Mitchell, P comments on NZ wind turbine noise guidelines, and a simple solution

<http://waubrafoundation.org.au/resources/victorian-guidelines-for-noise-from-wind-turbines-simple-solution/>

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