# Submission against the proposed Winterbourne Wind Farm EIS

## Summary

I raise an objection to the environmental impact statement of the proposed Winterborne Wind Farm on the following grounds

1) The noise report suggests a level of noise intrusion that will not be consistent with the stated objective of the 'NSW Wind Energy: Noise Assessment Bulletin'
2) The noise data presented appears to contain a number of flaws that coincidently are biased towards the proponent including
    a. The noise floor of the acoustical equipment skews background noise data upwards
    b. Data was collected over the summer months when background is typically at its greatest
    c. Consideration and modelling over cumulative noise impacts appears absent
    d. The information over noise tonality is based on assumptions, and not demonstrated.
3) The health and quality of life of humans in involved dwellings is largely ignored – chiefly of dependents who are in no or little position to escape the noise nuisance from the wind turbines, but also of surrounding residents who (as evident in the proponent's data) will at times suffer a noise level over six times greater than background noise.
4) The principle of "prudent avoidance" with reference to human health is poorly applied.
5) The potential or known impacts of infrasound on human and animal health is not even discussed or considered.

## Introduction

The Winterbourne Wind Farm proposal will only be one of the many parts of the New England Renewable Energy Zone: many other wind farms and solar PV installations are also proposed to go up in the region. The overall contribution to the national electricity generation will also be minimal – the anticipated output may not exceed 2 tera watt hours annually – i.e. less than 1% of the 267 tera watt hours of electricity generation that occurred in 2021 (Energy.gov.au).

Despite this insignificant overall contribution to electricity generation, the Winterbourne Wind Farm proposal is said to have a ***direct*** environmental impact over 22000 hectares of land – or about 0.5% of the total land mass of NSW. It will also have rather predictably visual and acoustical impacts over ten of thousands more hectares of land and the township of Walcha. The total land mass impact is therefore likely to exceed 2% of the total landmass of NSW.

Furthermore, the project is an intermittent renewable energy project. The energy output of the project is unlikely to be used in a highly efficient manner. Surplus energy will at times need to be stored; and in times of renewable energy dearth, back-up solutions will need to be in place once energy storage facilities are depleted. The total impacts of this project therefore will be broader than stated in the EIS.

A project with such vast geographical impacts but of only marginal contribution to the total generation capacity of the electricity grid, should only be allowed to proceed if its impacts are rather benign with little if any interference with other rural activities.

For reasons that I outline below, the Winterbourne EIS does not adequately address known or suspected impacts of wind turbines. Furthermore, the noise data provided within the EIS raises major questions over the project's compatibility with the region, even before the potential flaws are considered.

With reference to regulatory requirements and guidelines, the objections to the project are raised with the reference to the SEARS for 'Noise and Vibration', 'Biodiversity', and health under 'Hazards and Risks'.

## Wind noise guidelines

The NSW Wind Energy: Noise Assessment Bulletin, in the section 'Noise Limits and Objectives states that:

> *The purpose of setting noise level objectives for wind turbines is to retain noise levels that are compatible with surrounding land uses and to ensure that noise levels do not significantly affect the living experience of people residing in the area.*

The NSW Wind Energy: Noise Assessment Bulletin also stipulates that the criterion for noise shall be:

> *The predicted equivalent noise level (LAeq,10 minute)*, adjusted for tonality and low frequency noise in accordance with these guidelines, should not exceed 35 dB(A) or the background noise (LA90(10 minute)) by more than 5 dB(A), whichever is the greater, at all relevant receivers for wind speed from cut-in to rated power of the wind turbine generator and each integer wind speed in between.*

For reasons that shall become apparent later in this analysis the above criterion shall not necessarily fit in with the main objective of this policy, and the proponent should be required to provide further information to demonstrate that the noise from the development shall "*not significantly affect the living experience of people residing in the area."*

It is also important to note that the adherence to published noise guidelines is no protection against claims of noise nuisance as was demonstrated in the recent decision of the Victorian Supreme Court in *Uren v Bald Hills Wind Farm Pty Ltd* [2022] VSC 145 (**Uren**).

### Wind speed vs background noise data

The Sonus report presents noise data between 28 November 2020 and 1 February 2021. This coincides with the period of the year when atmospheric inversions are rather uncommon, and the evenings are frequently affected by storm activity. The period quoted above in the memory of the author, also coincided with mostly overcast and rainy days – which again would have given higher than anticipated background noise data. Evidence of this can be seen on the BOM website using the Thee St, Walcha location: Daily Global Solar Exposure - 056234 - Bureau of Meteorology (bom.gov.au)

The situation during winter nights in the region is rather different. Atmospheric inversions are rather common, and storm activity very occasional. This also coincides with the drier part of the year. Nights are frequently very still and quiet. During nights with an atmospheric inversion it is rather

common to find that the wind speed at ground level is essentially still, yet at higher altitudes (as evidenced on the tops of hills) the wind flow continues unabated.

**The proponent should be asked to present background noise data that reflects the probabilities of other seasons of the year, or otherwise stratify the existing data (if there is enough data to draw meaningful conclusions) that reflect background noise and the level of intrusion from wind turbines on quiet nights when an atmospheric inversion occurs.**

Furthermore, the proponent has not stratified the noise data to reflect the probabilities of high wind speeds at the hub height vs low wind speeds at ground level. Yet, what is readily apparent is that noise levels (Table 11 in the Sonus report) are predicted to be in excess of 35dBA at times of high wind speeds at the hub. Yet in Appendix E, particularly with dwelling SR086 (but not only) the background noise level is frequently at the floor of the noise monitoring equipment at hub wind speeds of more than 10m/s. The difference is almost 20dBA – i.e. a noise level increase of more than six-fold! It is beyond doubt that this difference is not consistent with the objective of the NSW Wind Energy: Noise Assessment Bulletin that the 'noise levels do not significantly affect the living experience of people residing in the area'.

**Given the significant and regular probability of severe noise intrusion (self-evident from the data in Sonus report), the proponent should be asked to put an ongoing noise monitoring process in place and shut down the wind turbines or employ other noise reduction strategies.**

## Noise floor of the acoustical equipment

The noise floor of acoustical equipment is a little less than 20dBa. This does not allow for an accurate measurement of the background noise level in quiet locations away from roads. Evidence of how this produces bias in the data set can be seen in the "SR109 Background Noise Level Correlation" – a noise monitoring location that is said to represent 22 dwellings around the proposed wind farm.

Dwelling SR109 is on a very remote location on the north-eastern edge of proposed development which also happens to be an area that has not been cleared and backs-up onto a national park area. The bias introduced by the noise floor of the equipment is evident in that the intensity of the plot values around 20dBA increases dramatically at wind speeds less than 8m/s. The average noise reading therefore flattens out to about 25dBA as the wind speed approaches 3m/s. A visual inspection of the plot suggests that actual noise average level at 3m/s is probably less than 20dBA with a strong probability that many readings would have otherwise been less than 15dBa.

If the data were furthermore teased out between daytime and night-time readings, then the nocturnal noise level might frequently fall below 15dbA – particularly when ground wind speeds are zero. The suggestion that a noise level of 35dBA is an acceptable intrusion, (i.e. a noise level 8 times louder than background noise at the quietest of times) borders at the very least gross negligence on behalf of the developer and acoustical firm involved and casts more doubt on the ability of the developer to satisfy the main objective of the NSW Wind Energy: Noise Assessment Bulletin. Even if the predicted noise level from the wind turbines is only 25dBa it will still be up to five folder louder than background noise levels.

**There are strong reasons to suspect that the noise floor of acoustical equipment employed grossly overestimates the average noise in the quieter parts of the proposed development. The proponent should be asked to provide data that accurately reflects the average noise level at these locations and demonstrate how the proposed development would not constitute a level of noise intrusion that does not significantly affect the living experience of people in the area. Failing that this should be grounds for not approving the proposed development.**

## Cumulative Noise impacts – Noise modelling

The broader extent of noise intrusion is not discussed in the Sonus report.

Wind turbine noise is reported to be audible to the human ear over 10kms away (Expert Review of the Evidence on Wind Farms and Human Health | NHMRC, 2015.) The known long-distance issues of wind turbines noise appears to reflect the role of low frequency noise and infrasound – particular the harmonics which ultimately become audible to the human ear.

The proponent states that the CONCAWE noise propagation model and SoundPLAN noise modelling software were used to predict noise levels. Beyond that, the proponent yields no information about what input data was used in the modelling and does not demonstrate that the cumulative noise impacts of over 100 wind turbines have been considered.

**The proponent should be asked to clarify what input data was used when using these models, i.e. whether the modelling of noise was done in a way that reflects only the most proximal wind turbine or local cluster of wind turbines around each noise monitoring station, or the total cumulative noise impact of the wind farm. They should also be asked to justify why dwellings further away (say 5kms) are not considered affected non-associated dwellings.**

## Tonality of low frequency noise

With reference to tonality the Sonus report states:

> *"this assessment has been made based on the assumption that the turbine model selected for the project will be free of any excessive levels of tonality. The assumption has been confirmed for the representative wind turbine model by reviewing the 1/3 octave band data."*

The proponent therefore fails to follow the methodology preferred by the SA 2009 wind farm noise guidelines – i.e. that of the IEC61400-11 standard.

The other peculiarity is the role of the wind turbine manufacturer, Vestas, which according to the Winterbourne Wind Farm website:

> "*Vestas and CIP are progressing the development of the project with the aim of commencing construction in 2024."*

This leaves this "assumption" or "confirmation" over tonality as lacking any impartiality or independence, and rather could have been influenced by a conflict of interest.

**The proponent should also be asked to assess the issues of tonality in line with the IEC61400-11 standard. Otherwise, the proponent should be asked to adhere to the penalty for tonality.**

## Non-compliance at involved dwellings

Apart from the obvious non-compliance of higher frequency noise, the presence of low frequency noise (and infrasound) from wind turbines is highly concerning as it is not just an audible intrusion but can resonate with structures and human body parts and create highly disturbing physical nuisance (Cooper, 2015).

The proponent recognises that the dB(C) level of low frequency noise should be less than 60dBC at non-associated dwellings. However, strangely, the proponent does not demonstrate any

understanding or concern for the safety of residents of associated dwellings – particularly of dependants who may against their will be exposed to inappropriate levels of noise intrusion and chronic sleep disruption.

In Table 6-16 the sound power levels of the low frequency have been quoted by applying a dBA filter and are thus artificially attenuated. Despite this they readily exceed safety limits of 60dBC.

It is not clear from the EIS or the Sonus report how the proponent shall manage this important safety aspect and how (if at all) the potential risks have been communicated to the residents of associated dwellings.

**The proponent should be asked to demonstrate that the noise intrusion, particularly of low frequency noise, is safe at associated dwellings, and in the interests of public health, develop a plan that will manage this issue once the operation of the wind farm commences.**

# Biodiversity and Human Health

## Infrasound

The proponent does not discuss the issue of wind-turbine generated infrasound, even though it is significant noise pollution issue – ironically the most significant under certain operating conditions. Wind turbines are known to produce infrasound that at times is detectable up to 90 kilometres away (Marcillo et al., 2015)

Whilst the health risks of infrasound and low frequency noise (ILFN) are not settled science, there are several pertinent details that Dr Rapley, one of the international experts in the area of low frequency noise and infrasound, points out: ILFN can be bioactive, disturb autonomic functions; is means of communication between numerous species of animals;  a means of which animals can detect prey or predators; produces stimulation of the outer hair cells of the human ear; can have unpredictable and inconsistent psychoactive effects on humans; is frequently perceived rather than heard and appears more disturbing to the nervous system when it is just below the hearing threshold; can produce changes to heart muscle contractility and is suspected of causing morphological anomalies in connective tissue (Rapley, 2018).

## Health

The proponent mainly discusses risks associated with electro-magnetic radiation – not noise intrusion or even the basic mental health issues associated with the loss of visual and acoustical amenity.

With reference to the associated issues with loss of visual and acoustical amenity, the issue is rather straight forward. Humans are likely to suffer emotional turmoil, which in turn may engender the development of mental illness when something is unfairly taken away from them. Many rural residents live in quiet and peaceful rural areas because that is exactly what they are seeking. The wind farm may take this away overnight and permanently for many.

The intrusion on visual amenity in the form of shadow flicker may extend many kilometres when the sun is at low angle. The intrusion will be potentially entering into people’s bedrooms first thing in the morning, or interruption with their living and meal areas in the evening.

With reference to the "prudent avoidance" principle little is said about the inconclusive nature of the 2015 NHMRC statement on wind turbines, which suggests that harm to human health from wind turbine noise is possible.

With reference to the WHO guidelines on "Prudent Avoidance" the proponent appears to confuse the importance of electrical power with their self-determined importance of the project. Nowhere is there any reason to believe that the proposed Winterbourne Wind Farm is in anyway essential to generation of electrical power. Rather it is a dispensable project that on average will be contributing less than 1% of Australia's electricity needs.

There are numerous other non-carbon sources of electrical generation that could be employed instead, and some of these options, such as hydro and nuclear power are much less resource intensive and noise polluting than wind turbines (Gates, 2022). For the reasons that will become evident below, the cheapest option for "Prudent Avoidance" would be for the proponent to scrap the project in its entirety, build it elsewhere where there are no humans around or focus on other forms of energy production instead. Noise breaks, home noise insulation etc. do not protect against low frequency noise – it simply makes the problem of low frequency noise more dominant!

The proponent, even though not required in the SEARS, quotes the experience of the National Wind Farm Commissioner 2020 Annual Report and the inconclusive nature of this report. The proponent strangely does not discuss any adverse findings against the wind industry such as that of the recent decision of the Victorian Supreme Court in *Uren v Bald Hills Wind Farm Pty Ltd* [2022] VSC 145 (**Uren**), which suggests that inappropriate levels of noise intrusion and harm to human health could occur regardless of whether wind farms comply of noise guidelines.

Other developments since the 2015 NHMRC statement on wind turbines that suggest there are serious issues around wind farms have also been overlooked by the proponent. For example, the Federal Administrative Appeals Tribunal (December 2017) with reference to the taxation status of the Waubra Foundation, heard multiple expert opinions on wind turbine noise. The considerations of the tribunal included that:

1) WTN is complex, highly variable and has unique characteristics
2) There are numerous instances where wind turbines generate noise is excess of 40dBA.
3) There is an established association between WTN annoyance and adverse health effects
4) A significant proportion of wind farm noise is in the low frequency range.
5) When it is present, due to its particular characteristics, low frequency noise and infrasound can be greater indoors than outdoors at the same location, and can cause a building to vibrate, resulting in resonance;
6) Humans are more sensitive to low frequency sound, and it can therefore cause greater annoyance than higher frequency sound.
7) Even if it is not audible, low frequency noise and infrasound may have other effects on the human body, which are not mediated by hearing but also not fully understood. Those effects may include motion-sickness-like symptoms, vertigo, and tinnitus-like symptoms.
8) There is at present no "dose-response" curve which applies to wind turbine sound which can be used by policy makers to set appropriate limits on wind farm sound emissions.

**In conclusion, if the proponent was to exercise "prudent avoidance", then this would include not installing wind turbines anywhere near dwellings, associated or not. The potential impacts may extend many kilometres further than the proponent would be willing to admit. The number of**

**households affected by this proposal, including those living in the township of Walcha suggest that "prudent avoidance" would be to scrap the proposal altogether.**

## Animal Health

Apart from the flying animals that will be killed during the operation of the wind turbines, the other important question of animal health is poorly addressed by the EIS. Animal health impacts are important, not only because they may affect biodiversity, but also because they may have impacts of farm animal health and the quality of the products produced by these animals.

Helldin et al. (2011) point out that much of the research on animals to date had suggested that animals generally habituated to the presence of wind farms. Interesting Helldin et al. (2011) also point out that animals that are deprived of food generally move into areas of higher food availability, despite the increased risk posed by predators. Despite all the photographic anecdote and wind industry advertorial material of animals resting around the bases of wind towers, the research available prior to 2011 did not answer important questions about animal health and welfare.

Since 2011 there have been few studies that yield any further information about animal health. Of the few that could be located, a brief summary is provided: One study on reindeer found that that the reindeer were more likely to avoid sites around wind turbines during the operation phase, rather than construction. This has occurred even though in the construction phase, there was much more by way of human activity and the operation of other machinery (Skarin et al., 2018). This study suggests that wind turbine operation was perceived as more threatening to the reindeer than the presence of humans and construction activities.

Kumara et al. (2022) performed a bird-biodiversity study around long-established wind farms in India. The authors noted that there were associations between the peculiarities of bird species distribution and the presence of the wind turbines.

Perhaps the most insightful of studies have been those examining pathological markers of stress. Two such studies were located. The first found that wild rodents had higher corticosterone levels when living closer to wind turbines than further away (Łopucki et al., 2017). Another found a similar association in badgers (Agnew et al., 2016). The distance association of wind turbines with markers of stress is telling: animals may adapt to a life with wind turbines, but with all the health problems and suffering that goes with it.

**These studies suggest that wind turbines are at the very least an unwelcome intrusion towards many animals. At the very worst wind turbines can have major impacts on animal health, and risks having a significant impact on biodiversity and farm animal health and farm productivity. In the absence of data to the contrary, it is difficult to justify putting a wind farm on prime agricultural land and adjacent to a national park.**

# Conclusion

The proposed Winterbourne Wind Farm project, even if the noise data of the proponent as accurate, is likely to generate a major noise nuisance that is unlikely to be benign or compatible with the local environment.

The proponent's own data, despite the methodological flaws that appear to work in favour of the project, suggest that at times the project will create noise over six times that of existing background noise levels. This does not appear to be consistent with the main objectives of 'NSW Wind Energy:

Noise Assessment Bulletin' that the project that "retain noise levels that are compatible with surrounding land uses and to ensure that noise levels do not significantly affect the living experience of people residing in the area."

Rather the opposite: the project will significantly affect the living experience of many people in the area. The wind turbine noise is likely to constitute a major intrusion, even if operating within noise guidelines.

If the issues with humans appear significant, then the few knowns and the many unknowns about the response of animals to wind turbines raise major questions about how compatible wind turbines are with the surrounding national parks and the farm animals. These animals will be left to adapt to a new life with strange unnatural sounds that interfere with the ability to communicate and are likely to interfere with the ability of animals to hear and detect predators and prey. The animals will also be left to adapt to an environment that is likely to negatively impact their health and affect the balance of biodiversity and the productivity and quality of farm produce.

The summarise: this wind farm proposal is more a large wind energy industrial complex. It shall consume at least 0.5% of NSW, with impacts that are likely to go far beyond that. The noise issues may affect the township of Walcha and the long distance issues with low frequency noise and infrasound have the potential to causes issues many kilometres further away to include Armidale itself, many other rural towns and the surrounding Gondwana rainforest areas. Yet the proposal will at the only be generating about 1% of Australia's energy needs.

To conclude: the EIS should be rejected, and at the very least the proponent should be asked to address the apparent flaws with their noise data , identified in this submission, and where relevant to clarify the obscurity behind the assumptions and methodology in the noise report.

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