Modifications will emit more ILFN

The proposed changes from the original submission are for much larger blades and more powerful turbines. Peer-reviewed research has shown that both increased turbine power and larger blades are associated with:

- increased total noise
- a greater proportion of the noise as infrasound and low frequency noise (i.e. the noise believed to be most harmful to health)

The Department should be aware of this research. If you are not, please contact me and I will point you to the research which is publicly available.

Modelling is inaccurate and cannot be relied upon

The proponent's document admits that the wind farm could emit more noise than allowed under the guidelines. They also claim it may not. The simple fact is all modelling is inaccurate.

In an *Information Paper*[1] reviewing possible health effects of wind farms, the NHMRC stated:

> "Wind farm noise is complex and highly variable in character (e.g. tonality, frequency content and impulsivity). These characteristics and the duration of exposure influence the way in which wind farm noise is perceived. Perception is also influenced by characteristics of the person perceiving the noise — people who detect and recognise wind farm noise more easily may find it more annoying and people living in quiet environments may be more sensitive to low-frequency noise."

and

> "The occurrence of amplitude modulation depends on a complex range of factors, including local atmospheric conditions, topography, turbine blade design and the way in which they are controlled. A particular turbine type may exhibit the effect in one site but not in another. The effect varies greatly with distance, wind direction and over time, including whether it is day or night time (it may be more common in the evening or night).
>
> When multiple wind turbines are producing sound, the total sound pressure level at a particular location is affected by the sequence of the arrival of the sound (referred to as coherence). For example, if each of the turbines' blades are turning at the same time and are the same distance from the location, the sound from all the turbines would arrive at the same time, increasing the "loudness" of the sound. Amplitude modulation may be enhanced when this coherence effect occurs. However, if some turbines are further away or located at 180 degrees, there will be "cancellation" of some of the sound. These effects also vary depending on meteorological conditions, distance and location."

and

> "It is not yet possible to predict the complex and highly variable characteristics of wind farm noise (e.g. amplitude modulation)."

[1] *Information Paper*, pp. 15-16.

Note that last quote: ***"It is not yet possible to predict the complex and highly variable characteristics of wind farm noise (e.g. amplitude modulation)."***

If it is impossible to predict "the complex and highly variable characteristics of wind farm noise" then it is logically impossible to model them. Therefore, according to the NHMRC, the modelling for this proposal cannot be relied upon.

The rest of the above quotes from the NHMRC explain why noise measurements taken at one time (e.g. after commissioning) may be quite different from noise emissions at other times.

Given that the modification will tend to increase noise levels and ILFN levels, and that according to the NHMRC these are both unpredictable and cannot be accurately represented by measurements at one time, the modification should not be approved unless:

- there is permanent 24/7, full spectrum sound monitoring;
- at sufficient locations around the wind farm to provide a comprehensive history of noise impact at all residences within at least 10 kms; and
- with the complete data permanently available to the Department **AND** to all residents who believe they may be noise affected, and to their advisors.

Cumulative Effects with Gullen Range wind farm

The noise modelling done for this proposal appears not to have taken any serious account of the cumulative effect of noise emissions from Crookwell 1, 2, 3 **and** Gullen Range wind farm. In fact noise from Gullen Range wind farm appears to have been totally ignored in consideration of cumulative effects, despite that wind farm being close enough for some residents to be impacted by both.

Cumulative effects may occur in multiple ways. Note that the NHMRC has referred to coherence, where the wave phase from multiple turbines arrives at a location simultaneously (coherence) and thereby greatly increases the SPL. This effect can occur with audible and low frequency noise and, given the greater transmissibility of low frequency noise, the problem may occur long distances away for the latter.

In addition, there is the cumulative potential impact on people where changing wind directions make them exposed to noise from one wind farm at one time and then noise from another, so they are perpetually affected.

The noise modelling for this proposal should be rejected until it includes the cumulative effect with the Gullen Range wind farm.

Health

The NHMRC has commissioned a number of studies into the potential health effects of wind farm noise, including recurrent sleep deprivation. The Department is presumably aware of this. If not I can provide references.

This means that based on NHMRC advice and actions, the possibility of adverse health effects (including recurrent sleep deprivation) from Crookwell 3, especially with larger and more powerful turbines which tend to emit more ILFN, must be considered an open question.

On that basis it is essential that any approval:

- draw explicit attention to the developer's obligations under the *NSW Work Health and Safety Act 2011 No 10 (WH&S Act);*
- explicitly impose health protection obligations and conditions (including for sleep) such that Investor State Dispute Resolution (ISDS) provisions under any Australian trade agreement cannot be used to block or penalise the NSW Government for any subsequent actions it may take in relation to the wind farm to protect the health of NSW citizens or their animals. [If the Department is unaware of the ISDS issues, identified by the Chief Justice of the Australian High Court, I can provide relevant information.]

In relation to health, the *NSW Work Health and Safety Act 2011 No 10 (WH&S Act),* imposes certain duty of care obligations on anyone conducting a business in NSW, which obligations extend beyond their employees to include "other persons". Thus, s 19 (2) says:

> *A person conducting a business or undertaking must ensure, so far as is reasonably practicable, that the health and safety of other persons is not put at risk from work carried out as part of the conduct of the business or undertaking.*

Note that the Act does not simply preclude harm to employees and other persons but ***precludes putting them at risk***. The Act also forbids attempts to "contract out" of such obligations, e.g. in relation to hosts or residents on other associated properties.

Approval of the proposal by the NSW Government under a set of conditions which do not explicitly remind the developer that the WH&S Act also applies could reasonably give rise to the understanding that all the developer has to comply with are the conditions stated in the consent.

This risk is especially pertinent in the context of ISDS and the ability of ISDS tribunals, without any control by Australian courts, to make their own interpretations of approval conditions and impose penalties on the NSW Government for subsequent actions by the NSW Government which the tribunal believes reduce the value of a foreign owned investment.

Since the wind farm project is already owned by foreign parties, and history has shown the ease of transferring ownership to other foreign parties, to not protect the NSW Government up front by explicit statement of these conditions would in fact amount to corrupt negligence on the part of the government officials involved.