

## NSW WIND ENERGY: NOISE ASSESSMENT BULLETIN CRITIQUE OF THE AUGUST 2016 DRAFT FOR CONSULTATION

The draft *Wind Energy: Noise Assessment Bulletin* (the draft Noise Bulletin) was released in August 2016 as part of the NSW Department of Planning and Environment's proposed new wind energy planning framework that is presently being exhibited. The NSW Government is seeking feedback on the new framework by 16 September 2016.

The draft Noise Bulletin defines noise assessment criteria and noise compliance monitoring requirements for large-scale wind energy development projects that are State Significant Development (SSD). Specifically, the requirements would apply to:

- All new SSD wind energy proposals that obtain Secretary's Environmental Assessment Requirements (SEARs) after the date of publication
- All modification applications to a wind farm approval made after the date of publication
- Applications which have been submitted but not determined at the date of publication.

This critique compares key aspects of the NSW government's current approach to wind farm noise assessment with the requirements proposed by the draft Noise Bulletin, and provides comment on opportunities to improve the guidance.

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### Overview of Proposed Changes

The current NSW approach to assessing new or modified large scale wind farm projects is generally based on a combination of the 2003 South Australian document *Wind Farms: Environmental Noise Guidelines* (SA 2003 Guidelines) and elements of the 2011 draft *NSW Planning Guidelines – Wind Farm* (NSW 2011 draft Guidelines). The latter closely followed the 2009 South Australian document *Wind Farms – Environmental Noise Guidelines* (SA 2009 Guidelines), but defined procedures and assessment requirements that were specific to NSW.

The draft Noise Bulletin outlines an approach that is broadly similar to the draft NSW 2011 Guidelines, adopting the SA 2009 Guidelines supplemented by specific variations for NSW projects. Accordingly, new wind farm projects that have been designed to achieve compliance based on the current NSW approach would also meet the requirements of the draft NSW Bulletin in most instances. However, assessment outcomes may differ in some cases as a result of procedural details such as the draft Noise Bulletin not differentiating between day and night periods for background noise levels and setting criteria.

Further details and discussion are provided in the following sections.

### Base (Minimum) Limit

- *Current NSW approach*: 35 dB applied to all types of land zoning, irrespective of the uses promoted
- *SA 2009 Guidelines*: 35 dB in rural residential land zones only / 40 dB in all other types of land zones
- *Draft Noise Bulletin*: as per current NSW approach – 35 dB applied to all types of land zoning

The base limit of the current NSW approach and the draft Noise Bulletin are numerically equivalent. Importantly though, the draft Noise Bulletin does not retain a procedural requirement of the NSW 2011 draft Guidelines<sup>1</sup> which resulted in the base limit (and the noise criteria more generally) being more onerous than was inferred by the limit's numerical value.

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<sup>1</sup> The NSW 2011 draft Guidelines included a technical requirement to adjust compliance monitoring results by +1.5 dB to account for differences between  $L_{A90}$  measurements and  $L_{Aeq}$  assessment values

Defining noise criteria is ultimately a policy matter rather than a technical matter, and is based on achieving a balance between protecting the amenity of neighbouring communities and supporting a planning framework which enables the development of renewable energy projects. However, aside from brief references in the draft Noise Bulletin to higher population densities in rural NSW relative to South Australia, there is no indication of a quantitative analysis or policy impact assessment having been carried out in developing the noise criteria. This type of analysis is particularly relevant to wind farm noise policy development for the following reasons:

- Unlike other forms of development, noise criteria can have a direct impact on the viability and productivity of proposed wind energy developments. Seemingly small changes in noise criteria or assessment methods can have a significant impact on the potential renewable energy yield of a site, despite equating to subjectively minimal changes in wind turbine noise levels at receptor locations<sup>2</sup>.
- Noise limits can have broader strategic consequences in terms of the amount of development required to meet renewable energy targets. Setting lower noise limits may reduce the level of noise experienced at the nearest neighbouring houses. Conversely, by limiting the energy generating potential of each site, lower noise limits may mean that a greater number of sites are ultimately required to achieve a given renewable energy target, increasing the total population exposed to wind farm noise.

Additionally, in the absence of any relationship between the base noise limit and land use zoning, the noise criterion does not prioritise development in areas where industry and economic activity is promoted. Conversely, the limit does not differentiate areas where the planning system promotes rural living and potentially higher amenity from those areas where the planning system prioritises industry and economic activity.

These types of policy considerations should be informed by policy impact assessment based on modelling and spatial analysis<sup>3</sup>. For example, NSW has adopted significantly lower limits than are generally applied in South Australia and Victoria where wind energy development has occurred on a greater scale. An objective analysis could assist in determining whether the adoption of lower noise limits has significantly constrained renewable energy development in NSW, or conversely, if the rate of development has not been influenced by the adoption of lower limits.

Given the sensitivities surrounding the expansion of renewable energy development and the impact of the policy on renewable energy generation in NSW, this type of analysis is considered essential for credible policy development. In the absence of this analysis, the suitability of the selected base noise limit is unclear – in terms of both community expectations and broader government policy objectives.

### Low Frequency Noise

- *Current NSW approach*: C-weighted noise level triggers (60 dB  $L_{Ceq}$  night / 65 dB  $L_{Ceq}$  day) defined for detailed assessment of noise inside neighbouring homes. If detailed assessment inside the home indicates low frequency noise, an adjustment (+5 dB) is added to the A-weighted noise of the wind farm (for the relevant conditions)
- *SA 2009 Guidelines*: no requirements for low frequency noise
- *draft Noise Bulletin*: introduces similar but more stringent criterion than the current NSW approach. The night trigger of the current NSW approach is applied as a criterion for the 24 hour period under the draft NSW Bulletin. As a result, the adjustment (+5 dB) may be applied to the A-weighted noise of the wind farm based on the external criteria alone, unless a detailed assessment is carried out inside neighbouring homes.

Both the NSW 2011 draft Guideline and the draft Noise Bulletin acknowledge that low frequency noise is not typically a significant feature of modern wind turbine noise. Nonetheless, the draft Noise Bulletin proposes stringent criteria which could unnecessarily constrain renewable energy development.

<sup>2</sup> *Wind Farm Noise Predictions: The Risks of Conservatism*, Adcock J, Bullmore A, Cand M, Jiggins M, Second International Meeting on Wind Turbine Noise, France 2007. This study demonstrated the potential for differences of the order of 3 dB to translate to substantial reductions in energy generating potential - of the order 40 % loss in generating potential

<sup>3</sup> The Sustainable Energy Authority of Ireland provides an example of how spatial analysis and development constraints mapping can be used to inform policy – see: <http://www.seai.ie/>

The following key issues are associated with the proposed low frequency criteria:

- Experience with some proposed sites is now indicating the potential for the low frequency criteria to be more restrictive than the A-weighted noise criteria for certain wind farm designs. However, there is little reliable evidence to indicate that wind farm noise at, or above, the proposed external and internal thresholds would be sufficient to result in low frequency noise issues. In particular, the detailed assessment method in the draft Noise Bulletin is based on application of a UK government guidance document in a manner that directly contradicts the stated purpose and limitations of the guidance. Specifically, the UK guidance states:

*It is suggested the proposed criterion be used not as a prescriptive indicator of nuisance ...*

And:

*... it is clear that problems do not necessarily arise when the criteria are exceeded.*

Despite these statements in the UK guidance, the draft NSW Noise Bulletin applies the UK guidance prescriptively as a pass/fail test for low frequency noise.

- The draft Noise Bulletin automatically applies penalty adjustments based on outdoor noise criteria unless a detailed assessment is carried out inside a neighbour's homes. However, indoor measurement introduce a raft of potential complications including access considerations, measurement contamination related to domestic sources inside a home and privacy issues associated with recording in resident's homes.
- There is significant uncertainty associated with the prediction of low frequency noise and the measurement of low frequency noise in windy environments.

The draft Noise Bulletin does not provide guidance on how to overcome these potentially significant complications, particularly if access to private homes is not available to the wind farm operator. It is acknowledged that these are not matters that can be easily addressed in a policy framework. However, this supports the adoption of a less prescriptive approach on low frequency noise, particularly given that the UK guidance that has been referenced specifically states that it clear that problems do not necessarily arise when the criteria are exceeded.

Further, while the draft Noise Bulletin attempts to address community concerns about low frequency noise by introducing objective criteria, the adoption of a prescriptive pass/fail criterion which can designate low frequency noise as problematic, even where no related complaints exist, could have the counter effect of unnecessarily exacerbating community concerns.

Notwithstanding the above, and acknowledging that the NSW government consider it is necessary to introduce objective criteria as a means of addressing community concerns about low frequency noise, a more appropriate approach could be to:

- Require C-weighted measurement data obtained during post-construction monitoring to be submitted as reference information for review by the regulator.

This data would then be available in the event that low frequency noise related complaints are received by the regulator. More broadly, obtaining this data would provide a basis for the NSW government's ongoing monitoring of the issue of low frequency noise.

- Require formal assessment of low frequency noise only in instances when related complaints are received and deemed by the relevant authority to warrant objective assessment.

This would avoid the problems of false-positive low frequency noise assessment outcomes when low frequency noise related complaints do not exist, in turn avoiding unnecessary operational restrictions.

- Specify external C-weighted noise thresholds and the detailed internal assessment method (UK guidance) as the relevant procedures that must be considered in any low frequency noise assessment plan that must be implemented following instruction by the relevant authority in response to related complaints.

This would provide a degree of flexibility for addressing the technical limitations and practical challenges of the reference methods on a case-by-case basis, accounting for project-specific circumstances (e.g. availability of homes for conducting internal noise measurements and recordings, and addressing potential discrepancies between complaint periods and periods when the reference thresholds are exceeded).

## Tonality

- *Current NSW approach*: simple assessment method<sup>4</sup>, but data according to a detailed international standard (IEC 61400-11<sup>5</sup>) is usually presented in noise modelling studies for reference purposes
- *SA 2009 Guidelines*: method of assessment is not explicitly defined, but reference is made to IEC 61400-11 as an example method of identifying tonality
- *Draft Noise Bulletin*: simple assessment method as per the current approach. Reference is also made to IEC 61400-11 tonality data, however this appears to only relate to candidate turbines and pre-construction assessments.

The simple method referred to in the draft Noise Bulletin is the same approach used to assess industrial noise sources in NSW. However, wind farms are a specific type of noise source that warrant specific assessment procedures. In this respect, experience has shown that the simple method often fails to detect wind farm related tones that are subjectively perceptible. This means the simple method could permit continued operation of turbines which would otherwise be identified as tonal using more appropriate and detailed methods, as implemented in other Australian jurisdictions and internationally.

It may be considered beneficial for the wind industry to be subject to less stringent requirements for tonality, particularly in the context of the lower base limit that is proposed to be retained in NSW. However, when present, experience has shown that tonality is one of the most likely causes of complaint about wind farm noise. Indeed, the presence of tonality in the earliest turbine designs in the 1990s was a significant cause of complaint about wind farms, which subsequently lead to an increased focus on tonality in wind farm assessment and turbine design. As a result, improved modern turbine designs now mean that the majority of modern wind farms are unlikely to be characterised by tonal emissions. This means that more onerous standards can be applied to tonality without compromising the potential for renewable energy development. However, a concession which could allow atypical sites that are characterised by tonality to continue to operate without restriction could have two effects:

- Create an incentive for the use of lower specification turbines in NSW relative to other markets
- Contribute to negative community perceptions about wind farm development

Therefore, while a more lenient tonality criterion may seem to provide a concession for the wind farm industry, the effect in practice may be counterproductive in the long term. Further, the use of a simple method may represent a lost opportunity to improve wind farm design standards and provide greater confidence to neighbouring communities about the control of tonal characteristics. For example, early sound emission testing in the construction phase of projects provides the opportunity to identify and avert tonality issues before a site becomes fully operational, limiting the chance of protracted community disturbance as a result of late detection during the commissioning phase of a project.

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<sup>4</sup> One-third octave band method specified in ISO 1996-2:2007 *Acoustics - Description, measurement and assessment of environmental noise - Part 2: Determination of environmental noise levels*

<sup>5</sup> International Electrotechnical Commission document IEC 61400-11 *Wind turbines - Part 11: Acoustic noise measurement techniques*

## Compliance monitoring

- *Current NSW approach*: compliance monitoring at receptor locations, with allowances for monitoring at intermediate positions. Assessment is based on downwind data points, with survey duration often capped at 6 weeks to account for locations where downwind conditions may occur relatively infrequently
- *SA 2009 Guidelines*: primarily requires monitoring at receptor locations – assessment is limited to downwind conditions only
- *draft Noise Bulletin*: continuation of current NSW approach with clarifications relative to the NSW 2011 draft Guidelines.

The NSW 2011 draft Guidelines included provisions for conducting compliance monitoring at intermediate locations positioned between a wind farm and surrounding receiver locations. This approach is retained in the draft Noise Bulletin and is considered a positive inclusion, and an aspect of the NSW policy which sets an example for other jurisdictions. This approach provides the benefit of:

- Enabling compliance monitoring at accessible locations that do not necessarily require intrusion on private on property (intermediate locations can often be cited within host land areas related to the wind farm)
- Enabling compliance monitoring to be carried at locations where the noise of the wind farm can be more reliably separated from background noise, enabling site noise models to be verified, subsequently allowing compliance to be investigated at a broader range of distant locations.

In terms of survey durations, experience has shown the 6 week period is a reasonable balance between capturing a sufficient range of conditions and avoiding very long survey durations which are generally not required on technical grounds. However, it would be prudent to consider including:

- Guidance on the selection of monitoring periods to avoid times of year when it is less likely that suitable wind speeds and directions will occur
- Guidance to specify longer periods for the assessment of special audible characteristics. Experience has shown that a one week period, as referenced in the draft Noise Bulletin, is unlikely to be sufficient for a complete assessment of the sound character of wind farm, particularly without any definition for the operating conditions of the wind farm during the one week period.