

Submission to Department of Environment, Land, Water and Planning

on

Changes to the regulation of wind farm noise.

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Noise standard compliance continuity assessment

The major WEF monitoring and assessment change from existing practice is the proposed regular compliance assessment.

1. *Lifetime compliance assessment and the five year testing proposal*

The RIS devotes 20 pages, nearly one third of the RIS, to the *options analysis*. That includes the quasi-scientific multi criteria (MCR) analysis to guide the selection of the optimum noise control measure. All regimes considered include periodic compliance assessment using the *relevant noise standard* (NZS 6808). Critically, that five year (or in one option, a ten year, and in another, a three year variation) compliance assessment cycle is a key issue in the MCR analyses.

In stark contrast to the options analysis and the MCR there is no discussion whatever that supports that choice of five years, or indeed of routine post-construction noise testing by the *relevant noise standard* at all. That is not acceptable. It is essential that that position be backed by evidence that WEF noise increases, or is likely to do so, over time; that testing according to the *relevant noise standard* is the best way to respond to that; and that the five year interval is prudent. The RIS describes what it intends to be done for lifetime noise compliance continuity, but not why.

There is no discussion of the merits or otherwise of the five testing regimes. The recommended regime appears to be decided on cost, not efficacy.

WEFs in Victoria and internationally have been in operation for sufficient time that there should be evidence of noise changes, if any, with time. For example the Waubra WEF has been in operation for over 10 years.

I support in principle ensuring continuing compliance. It is good engineering practice to ensure continuing compliance with design criteria. But the necessary ongoing testing requirements must be based on evidence and analysis.

Providing that the WEF continues to operate in the way the turbines were configured for the post-construction compliance assessment, including any turbine noise reduction modes, it is hard to understand how aerodynamic noise could increase.

It may be feasible that mechanical noise from the components in the nacelle might increase. But any such noise increase may be indicative of inadequate maintenance and possible forthcoming failure. The operators have an incentive to prevent failure and downtime.

The transformer placed adjacent to or within the tower would be a minor noise source. The noise would be indiscernible at any noise sensitive location. That noise is unlikely to increase

Whilst the regulation rightly requires the continuing noise compliance of each WEF I submit that it an unjustified imposition on the operators to undertake any such testing at five yearly intervals without the case for that being presented and closely scrutinised.

2. *The proposed Regime 4 without background noise monitoring*

The RIS proposes that the five year periodic WEF noise compliance assessment will not require background noise monitoring to be undertaken coincidentally with that assessment. It intends that the pre-construction background noise levels determined in accordance with the *relevant noise standard* be used. It argues that this is an appropriate measure, suggesting that the background noise will remain stable and that the costs of WEF shutdown that would be needed for background noise testing is high. That is, it proposes Regime 4 rather than Regime 1. It appears that this is intended for both new and existing WEFs although that is not clear.

I do not support this proposal.

The RIS states;

Testing regimes 4 and 5 utilise the existing background noise level measurements from pre-and post-construction assessments (Note; that is incorrect, there are no post-construction background noise assessments under current practice. That would require the WEFs to be turned off). They would provide an adequate assessment of compliance in a situation where background noise levels do not significantly change over time from the pre-construction measurement levels.

Measuring the contribution of WEF turbines to noise levels can only be done with consideration of the background noise level. However in most cases it is likely that background level would only increase over time as wind interacts with other physical elements in close proximity to a noise sensitive area. Typically increases in background noise result from vegetation growth, which occurs steadily over an extended period of time. In this way, compliance with noise limits that utilise pre- and post-construction background levels (Note; see note above) would provide a conservative estimate of ongoing compliance.

In the (relatively unlikely) event that background noise levels do change over time, the New Zealand Standard and the Noise Management Plan for the WEF will contain alternative testing approaches that can deal with any significant change to background noise levels that may have occurred.

Where circumstances warrant, under the EP Act, EPA can issue notices that, among other actions, request a full assessment be undertaken where there is a likelihood that the pre-construction background noise levels may have changed significantly over time. (RIS p.35)

I respectfully disagree with much of the above extract.

There is no place for words like 'likely', 'adequate' and 'significantly' in a proposal where rigour and defensibility should be paramount. This argument that background noise levels can be used with apparent confidence may be a convenient argument that suits the case. I submit that it is a flawed argument.

The notion that one may suspect the likelihood of a change in background noise levels is rather fanciful other than in very obvious circumstances.

In normal acoustic matters a change of 1-2dB in audible sound would be considered largely undetectable by human hearing and hence immaterial. But in this case, at wind speeds above the low speeds where a limit of 40dBA_{L90} (10 min) applies, the permitted increase of the compliance curve over the background noise level curve is 5dB. A small change in the background noise may make a material difference. That otherwise insignificant change cannot be dismissed in this case.

The comment that*the New Zealand Standard and the Noise Management Plan for the WEF will contain alternative testing approaches.....* seems to lack substance. I am not aware of any provision in the *relevant noise standard* that provides for periodical compliance testing as is proposed here, and it is presumptuous to suggest that it *will*. It is not apparent that the *Noise Management Plan* will, as a matter of course, suggest approaches to continued compliance assessment at variance to that proposed in the regulations.

Just as it can be argued that vegetation may grow and results *would provide a conservative estimate of ongoing compliance* it can similarly be argued that vegetation adjoining a noise sensitive location may be removed, lopped or pruned, replanted or otherwise altered; buildings may be removed or modified; garden walls may be built (*the physical elements* of

the extract), and traffic patterns on any nearby roads may have reduced. That is, results may become less conservative and may be failing to detect non-compliance.

Thus the background noise profile may remain substantially unaltered, it may be greater, but it may be less.

To rely on the background noise levels used for the pre-construction assessment is to rely on information from some time in the past and which may no longer provide the correct baseline that is critical as the compliance reference. Consider, for example the proposed Ryan Corner WEF. This was approved in 2008. Construction is intended to commence this year. Over the perhaps 25 year life of a wind farm one could be relying on a background noise assessment that is dated by 40 years or so, unless that background noise assessment has been re-established recently in which case it might be 30 years.

It is claimed that '*On balance, testing Regime 4 is the preferred approach as it best balances the benefits of improved certainty, confidence and compliance with the cost imposed on industry.*' (RIS p.41). I submit that the proposed Regime 4 provides no certainty of compliance and is damaging to confidence.

I suggest that if this proposal is adopted it may leave open the possibility of challenge that a compliance assessment that demonstrates a result that is within the noise performance criteria ie. apparent compliance, is flawed. Flawed because it could be argued that the background noise levels have decreased because changes are claimed to have occurred to the *physical elements* that have caused that decrease.

Conversely, if the testing showed apparent non-compliance an operator could claim that the background noise has become higher citing, for example vegetation growth, and hence the compliance curve has moved upward, and thus the WEF could be in compliance. However an outcome of this may be a direction to re-establish the background noise requiring a WEF shutdown.

The RIS asserts '*.....these Regimes (1, 2 and 3) requiring re-establishing background noise would not be a practical requirement to determine compliance*' (p.41). I do not accept that argument. In my opinion re-establishing the background noise is essential to a rigorous compliance assessment.

I submit that Regime 1, and not Regime 4 should be implemented if this compliance continuity proposal is to be implemented. I acknowledge that that comes at higher cost. That is, it is the cost of a credible program that to quote the RIS provides '*certainty, confidence and compliance*' with the *relevant noise standard*. (RIS p.41)

I note that at 131C of the regulation exposure draft for a new WEF ie. commencing operation after 1 July 2021 is, by 131C(c), to use the pre-construction background noise assessment. I suggest that that clause be varied to require that the background noise levels be determined within 12 months of construction commencing. That would require a further determination to that used for the planning permit application, but it reduces the time

between the pre- and post- construction assessments, possibly to four years or so rather than several or many more years than that.

(Note; I suggest that 'commencement of construction of the facility' and 'commencement of operation of the facility' should be defined. This latter may be able to be tied to an Essential Services Commission approval. Further, I suggest that 'background noise level' be replaced with 'background noise levels' since it is not a single figure; more strictly it is a (regression) curve.)

How to deal with an existing facility to achieve a similar outcome is rather more vexed. It appears that the proposed regulation 131F is intended for WEFs existing before 1 July 2021. I find it impenetrable, including that subregulations (1) and (2) each refer to the other. However, that regulation makes no mention of the background noise requirement for assessing compliance. That seems to be incompatible with the RIS. Background noise levels for some of those WEFs will be well in the past and for some very early ones those background noise data may not exist. Moreover, those assessments may lack some of the data collection and analysis rigour that has been learnt over some years. For example Codrington WEF commenced operation in 2001, Toora in 2002, and Waubra in 2009. The reliability of using background noise assessment that may be 15-25 years old by the time a 'compliance;' assessment is undertaken is questioned.

Assertions are no substitute for evidence in dealing with matters requiring rigour and defensibility, and for which certainty, confidence and demonstrating are critical features. In my opinion this proposal of not having near concurrent background noise levels does not measure up.

3. Noise sensitive locations

Should the proposed Regime 4 go ahead some attention is suggested to the number of noise sensitive locations to be monitored for noise compliance assessment for both new and existing WEFs.

The RIS states;

The testing regimes 4 and 5 require noise measurements at noise sensitive areas while turbines are operating. Regime 5 may be considered a subset of regime 4 with noise measurement only undertaken at specific noise sensitive areas (compared to regime 4 where noise measurements are undertaken at all identified noise sensitive area in the pre-construction and initial post-construction noise assessments). (RIS p.35)

(Note; the text might better refer to noise sensitive 'locations' not 'areas' to be consistent with NZS 6808, but high amenity 'areas' as per the standard.)

That last part of the final sentence, in parentheses, is wrong. Not **all** noise sensitive locations are monitored.

The noise sensitive locations within the zone of modelled audible noise impact, including any high amenity areas, are identified and a selection representative of the locations is made for pre-construction background noise monitoring. Other noise sensitive locations are deemed to have a *similar* background noise to a particular selected location based on a comparison of characteristics such as topography, vegetation and the like. These selected locations must have a suitable place for unattended noise monitoring, be secure, and agreement must be able to be reached with the property owners for siting the instruments and having access. The same locations are used for the post-construction monitoring for compliance assessment.

If the Regime 4 proposal is to follow that practice then consideration needs to be given to the number of monitoring locations. It is likely that over time one or more locations will become unavailable. There is a difference in that likelihood of available location attrition for the present system of perhaps five years or a bit more between pre-construction background monitoring and post-construction compliance assessment, and the proposal of assessment every five years which might stretch to twenty five to thirty years.

The consequence of this is that to ensure sufficient noise sensitive locations being available through the needed period of WEF compliance assessment ie. the lifetime of the WEF it would be prudent to recruit more locations initially than would otherwise be needed.

To put a hypothetical example on this if there are 50 noise sensitive locations identified perhaps 6-8 locations might be expected to be used for the present system with the prospect of little loss of locations. With what is proposed it might be wise to obtain, say, 15 locations so that there is some likelihood of the retention of sufficient locations over that expected much longer period.

What to do with existing WEFs is more challenging. To think that a WEF that had 6 locations for background noise assessment in 2015, was compliance assessed in 2020 and might still have those locations available in 2045 is rather a stretch. A closure of existing WEFs to do background monitoring would provide the opportunity to recruit sufficient noise sensitive locations for monitoring to accommodate the anticipated further life of such facilities.

The issue might need to be added to the cost estimates.

This issue does not arise with Regime 1.

4. *An alternative approach*

I propose a possible alternative method for WEF noise compliance assessment to that periodical five year program proposed in the regulation exposure draft.

The objective of the proposal for WEF noise standard compliance continuity assessment does not seem to be clearly articulated in the RIS. I suggest that it is to ensure that the *relevant noise standard* continues to be met post-construction of the WEF for the life of the approved facility (nominally 25 years) at noise sensitive locations that are neither contracted landholders nor have an agreement with the WEF operator.

The focus of the proposed regulatory action is solely the operating noise from the wind turbines of the WEF. Consider the individual noise sources from the wind turbines, their importance, how they might vary over time, and how that noise might be managed.

First, the rotors (blades and hub) are identified as major noise sources. For a new WEF the compliance noise assessment is required within 12 months of commissioning the WEF, or in construction and commissioning stages if that is applicable. For that assessment the WEF will be operated in manner to achieve the required noise standards. That may be unconstrained if the design, including the modelling, has succeeded in achieving maximum energy output whilst meeting the noise compliance objectives. Or it may be constrained in some way by one or more turbines having to be operated in a noise reduction mode to meet those noise compliance objectives.

We will call this operating configuration, whether unconstrained or constrained the *reference noise compliance operating mode*.

Providing that the turbine continues to operate in that mode I expect that the aerodynamic noise would not increase over time.

Secondly, consider the nacelle. This contains mechanical equipment such as bearings, gears, the generator, cooling fans and hydraulic pumps, electric motors and the like. It is feasible that noise from some of these components may increase with wear or incipient failure. Equipment failure, or worse fire, is not in the interests of the operators. Sensors in the nacelle for parameters such as bearing temperatures and hydraulic pressures would be expected to be closely monitored. That would limit what might otherwise be increased noise. However there may be some noise increase and some unexpected failures.

I suggest that noise monitors be placed in, and possibly on and near (perhaps towards the top of the tower) to measure noise. Those noise measurements might include various noise averages, impulsive noises, frequencies and whatever is needed to characterise noise of the nacelle. I recognise that the noise may include the aerodynamic impact of the rotor.

Finally, the remaining possible noise source is the transformer mounted in the tower base or pad mounted adjacent to the tower. That is unlikely to contribute to audible noise at a noise sensitive location. It is not considered further.

My suggestion is that by documenting the *reference noise compliance operating modes* for the turbine rotors in the WEF and characterising and monitoring the noise at the nacelles coincident with *relevant noise standard* compliance noise testing, it should be feasible to

create a surrogate of the continuity of noise compliance with that *relevant noise standard* at noise sensitive locations.

For a new WEF, commissioned after 1 July 2021, that could be done along with the required post-construction compliance noise testing. That compliance noise test would be referenced against the pre-construction background noise assessment. For an existing WEF an additional background noise test would be needed in addition to a compliance test to set the reference noise levels. That would require a WEF shutdown.

I suggest that the assessment period be longer than the usual about 10 days needed for the *relevant noise standard* assessment to provide a robust and defensible methodology and data to support the use of this procedure.

I accept that there would be some work needed to establish the surrogate parameters and compile the data sets.

Using a surrogate approach is not revolutionary or novel.

I submit that this approach has a number of advantages compared to Regime 4. I suggest that it provides clarity, certainty, confidence, and compliance assessment, all of which are important issues in the RIS argument for the proposed regulations. Importantly, it provides compliance to be demonstrated continuously rather than at five yearly intervals, and non-compliance to be detected promptly by the continuous monitoring of noise generating sources. Thus, that identification of any change that might cause noise excursions can be responded to quickly.

Further, I suggest that it would assist communication with the regulator and the community in having this continuity of information.

The cost of this may or may not be greater than Regime 4 over the WEF lifetime; but it is most likely much less than Regime 1.

I note that the RIS states that the Regime 4 proposal would meet the threshold required by the EP Act for controlling unreasonable noise. I expect that this alternative approach which I propose would also do so, and arguably with greater certainty.

Further, I suggest that it may enable the operators to meet the obligations of the statutory requirement of the general environment duty by having immediate information on changes to noise generating operational parameters. In turn, that facilitates prompt remediation rather than relying on relevant noise standard testing at multi-year intervals and on complaints. That contribution to complaint avoidance and complaint resolution may be valuable.

So how might this work in a regulation and for the regulator? The following is intended to give some suggestions only of what the issues might be; it is not intended to be comprehensive or authoritative. Revision and development would be needed.

- The proposed regulation exposure draft requiring that noise monitoring, assessment, auditing and reporting at five yearly intervals with pre-construction background noise levels being used would be removed from that regulation exposure draft. Consequential changes would be needed to be made to the *Annual statement* and the *Noise management plan*;
- A regulation would be developed requiring the operators to instrument the nacelles of all turbines with noise measuring equipment as determined by EPA;
- A regulation would be developed requiring the operators to document the *reference noise compliance operating modes* of all turbines and the nacelle noise characteristics coincident with the post-construction noise compliance assessment for new WEFs, or a post new background and compliance assessment for existing WEFs;
- A regulation would need to be prepared constraining the operators to the *reference noise compliance operating modes* and placing limits on any increases of noise from the nacelles including averaged noise levels and short term noise excursions;
- The regulation would need to make provision for EPA access to WEF data on the *reference noise compliance operating modes* and to the nacelle noise monitors for compliance enforcement. It would be anticipated that some confidentiality agreement would be required;
- EPA would need the capacity to document *reference noise compliance operating modes* as a performance requirement and to interrogate operating data to ensure continuing compliance. That ability may need to extend to responding to applications for variations to the *reference noise compliance operating modes* for any turbines in the WEF. Any such variations would need EPA approval and would require the submission of evidence that such would not increase noise at noise sensitive receptors;
- EPA would also require the capacity to set operating limits for nacelle noise and to interrogate data and to assess any requested changes in nacelle noise conditions. As before, any such variations would need EPA approval and would require the submission of evidence that such would not increase noise at noise sensitive receptors;
- The regulation might need to enable EPA to appoint environmental auditors as required to audit information;
- Sufficient data should be made publicly available to provide community confidence of continuing compliance with reasonable constraints of some information being commercial in confidence. For example, that information might be available on line and in periodic summary reports.

Some of the above is not dissimilar in principle to the regulatory system that is proposed or would be expected with Regime 4, but with a different technical approach.

The basic principles of this proposal would be common across all WEFs. However the *reference noise compliance operating modes* and the nacelle noise increment limits would be specific to individual WEFs, although with both having a generic character. The

regulation would have to allow for that, perhaps by that being complemented by a permit that applies for the life of the approved WEF.

5. Conclusion

In principle I support continuing compliance assessment. In practice, as in this case, there may be considerable challenges in achieving this goal.

It is my opinion the proposed testing at five yearly intervals without background noise testing is does not meet the rigour required for a compliance program. It is likely to lead to uncertainty about compliance and may lead to conflicting positions. That is anathema to the importance espoused in the RIS of certainty, clarity and confidence. It may be indefensible if challenged. Testing with concurrent background noise assessment is costly but engenders certainty and community confidence. My proposal requires development and testing but would seem to overcome those shortcomings and offer a number of additional advantages.

I submit that the proposed noise standard compliance continuity assessment in the regulation exposure draft not be proceeded with. I suggest that an alternative approach be considered that might more effectively achieve the values sought by the proposal.

Failing that, I submit that the proposed Regime 4 be replaced with Regime 1.

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