24th INTERNATIONAL CONGRESS ON SOUND AND VIBRATION
23–27 July 2017, London

ICSV24
23-27JULY 2017
LONDON CALLING

AN ENVIRONMENTAL HEALTH OFFICER'S EXPERIENCE IN ASSESSING WIND ENERGY NOISE IMPACT ASSESSMENTS - BEFORE AND AFTER THE PUBLICATION OF THE INSTITUTE OF ACOUSTICS GOOD PRACTICE GUIDE

Dr. Chris Jordan

Irwin Carr Consulting Ltd, 7 Osborne Promenade, Warrenpoint, Co. Down, BT34 3NQ
email: chris.jordan@irwincarr.com

In May 2013, the Institute of Acoustics launched *"A Good Practice Guide to the application of ETSU-R-97 for the assessment and rating of wind turbine noise"*.

Prior to May 2013, it was not uncommon for Environmental Health Departments to enter into protracted arguments with respect to the robustness of submitted noise impact assessments accompanying wind energy planning applications. ETSU-R-97 was silent on a number of aspects of wind energy noise assessment, most notably prediction. Whilst a number of the authors of ETSU-R-97 in 2009 published a paper stating agreed relevant factors, as it carried no statutory weight, a number of acoustic consultants ignored the agreed factors and continued submitting reports relying on less conservative assumptions.

Examples of noise impact assessments undertaken prior to the publication of the IOA GPG are considered and how significant improvements have been gained since its publication. Examples of poor practice were mainly attributed to background noise level measurement survey selection/post-processing, wind speed measurement, and prediction methodologies. Planning appeal examples have also been provided which demonstrate how the IOA GPG has assisted Environmental Health Departments in ensuring that only robust assessments are deemed acceptable. Environmental Health Departments in Northern Ireland have pooled resources to purchase wind speed measurement equipment, as well as noise modelling software to improve the robustness of wind energy noise impact assessment reviews.

The IOA GPG has been viewed in Northern Ireland as significantly improving the robustness of wind energy noise impact assessments. It has also provided greater certainty to wind energy developers, as if followed, noise is unlikely to be a determining factor in application considerations.

Areas of future improvement could be focussed around cumulative noise impacts given the greater number of installed and permitted wind energy developments, as well as planning conditioning and amplitude modulation.

Keywords: Wind Turbine, ETSU-R-97, Guidance, Planning

1. Introduction

Wind turbines generate noise. As a consequence planning applications submitted for wind energy developments are supported by noise impact assessments endeavouring to demonstrate that noise impacts from a particular proposal are compliant with existing policy. Prior to the publication of the Institute of Acoustics *"A Good Practice Guide to the application of ETSU-R-97 for the assessment and rating of wind turbine noise"* (IOA GPG), in May 2013, it has been the experience of Environmental Health Officers in Northern Ireland that there was significant disparity in the assumptions and methodologies applied by acoustic consultants in determining the noise impact significance of a particular development. This lead to protracted arguments which benefited neither the Environmental Health Service, applicants, nor residents.

Northern Ireland whilst having a relatively small land mass, there are a large number of wind farm planning applications and more significantly a very large number of medium scale single wind turbines (typically circa 250kW). Renewable Energy Statistics published by the then Department of the Environment Northern Ireland note the number of submitted planning applications to 31st March 2015 equalled 3776 single wind turbines (2337 approved) and 182 wind farms (108 approved). Such high numbers of wind energy planning applications, resultant cumulative considerations, the legacy of a dispersed rural population, a wide variance in noise impact assessment quality and limited wind energy noise guidance placed considerable pressures on the Environmental Health Service as a key consultee to the planning regime.

The publication of the IOA GPG and its subsequent endorsement by the Northern Ireland devolved administration provided the Environmental Health Service with a statutory footing to challenge the less than robust noise impact assessments, with the Planning Appeal Commission - Northern Ireland supportive of the IOA GPG's recommendations. The IOA GPG has also provided greater clarity to the wind energy industry as to the expected level of detail and assessment necessary, thus ensuring that the industry through its due diligence reviews are able to eliminate less than robust assessments.

2. Rationale for the IOA GPG

Planning Policy across the United Kingdom directs applicants of wind energy developments to undertake a noise impact assessment following the principles of ETSU-R-97 *"The Assessment & Rating of Noise from Wind Farms"* September 1996.

Recognising the variation in the quality of wind energy noise impact assessments, seven eminent acoustic consultants (a number of which were co-authors of ETSU-R-97) with significant experience in wind energy noise assessment published an article *"Prediction and assessment of wind turbine noise – Agreement about relevant factors for noise assessment from wind energy projects"* – IOA Acoustic Bulletin March/April 2009 edition. This article was welcomed by the Environmental Health Service as providing direction. Due to the Article having no statutory footing, the Environmental Health Service whilst challenging wind energy noise impact assessments in variance to the agreed factors within the article, were typically unsuccessful in rejecting less robust noise impact assessments.

The Department for Energy and Climate Change in recognising continuing difficulties with the application of ETSU-R-97 funded research entitled, *"Analysis of How Noise Impacts are considered in the Determination of Wind Farm Planning Applications"* Ref: HM:2293/R1 dated 6th April 2011. The research concluded, *"The review has highlighted the potential problems faced by local planning authorities dealing with noise assessments for wind farm sites, both in terms of the way the documents are structured and in the variations in the way some factors are taken into account in the assessments. This suggests best practice guidance is required to confirm and, where necessary, clarify and add to the way ETSU-R-97 should be implemented in practice."*

The Department for Energy and Climate Change acting on the above recommendation funded the Institute of Acoustics to produce *"A Good Practice Guide to the Application of ETSU-R-97 for Wind Turbine Noise Assessment"* which was published in its final form in May 2013. The Good Practice Guide builds on the advice contained within the IOA Bulletin Article, providing detailed recommendations with regards to the numerous factors to be taken into consideration in undertaking an ETSU-R-97 assessment.

3. Prior to the IOA GPG publication – Examples of poor practice

Although page 83 of ETSU-R-97 stated, *"during the planning stage of a wind farm, discussions are likely to have been held with the local Environmental Health Officer … the prevailing background noise level at sensitive dwellings will need to be agreed with the local EHO…",* engagement by applicants with the Environmental Health Service was the exception as opposed to the rule. Typically, the first time the Environmental Health Service was aware of a wind energy proposal was when the

department was consulted with respect to the planning application. The Environmental Health Service therefore had no input into the number and siting of background noise level measurement positions, often resulting in limited confidence in the presented data. Applicants were commonly resistant to undertaking additional background noise level surveys in localities deemed more robust by the Environmental Health Service due to associated further costs and delays.

On occasion, local residents would have contacted the Environmental Health Service seeking advice with respect to background noise level monitoring being undertaken on their property. One such example presented in Figure 1 presents the monitoring location placed adjacent to two flags in an area of ongoing building works. Not unexpectantly the background noise levels were elevated, in comparison to others undertaken in the locality.

Figure 1: Inappropriate background noise level monitoring location

For this particular resident, there were three wind farm applications in the locality being determined concurrently. The three wind farm applicants all submitted noise chapters to support their Environmental Statements, each either measuring at or reliant upon proxy background noise levels to represent the same dwelling, as presented within Figure 2.

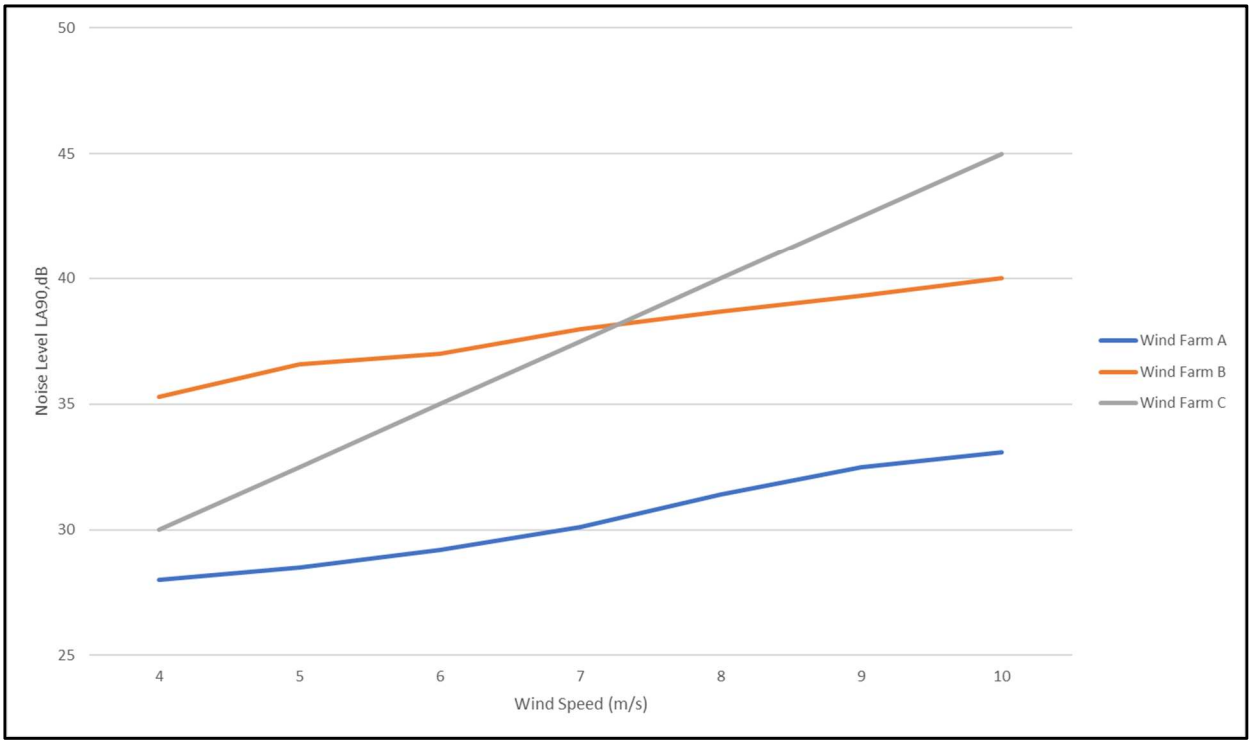

Figure 2: Three background noise levels representing the same dwelling

Given the differences between the measured noise levels (up to 10dB) this significantly eroded confidence in the robustness of Wind Farm B and C's measurement methodology.

Page 58 of ETSU-R-97 states *"The existing wind farm should not be considered as part of the prevailing background noise"*. The background noise level data as measured by Wind Farm B is presented in Figure 3.

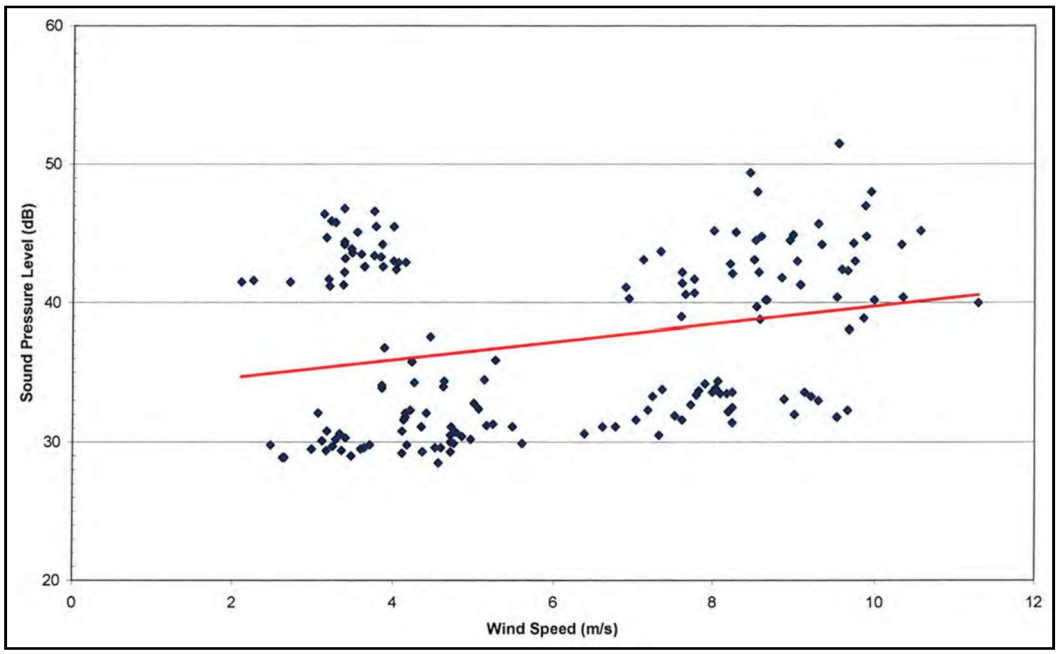

Figure 3: Background noise level data as measured by Wind Farm B

The dwelling is located approximately 600m from two existing operational wind farms. A simple review of the wind direction data noted that all the data points above the red linear regression line were when the dwelling was downwind of the existing wind farm. Further to exclusion of these data

points and a more appropriate regression analysis, the background noise level data undertaken by Wind Farm B concurred with those undertaken in a robust fashion by Wind Farm A.

Further to requesting details of the wind shield relied upon by Wind Farm C, it became evident that the acoustic consultant had not relied upon an appropriately specified double skinned wind shield as per ETSU Report W/13/00386/REP. It was therefore concluded that the background noise level data presented by Wind Farm C was unreliable due to the influence of wind induced noise on the microphone.

However, the Environmental Health Service came under considerable pressure from the Wind Farm B and C applicants to accept their presented background noise level data, as in the absence of the IOA GPG there was limited advice as to what constituted a robust background noise level assessment.

It was also common practice for applicants not to review their background noise level data for extraneous events. Figure 4 presents an example of a background noise level survey were clear extraneous noise events have taken place during the quiet waking hours. Speaking with the local resident, it was confirmed that neighbouring fields had been harvested for silage at the times of elevated noise levels, and hence not representative of the 'typical' background noise level of the dwelling. Again the Environmental Health Service came under considerable pressure from the applicant to accept their presented background noise levels with the extraneous noise events included, as in their absence the scheme as proposed would exceed reduced ETSU-R-97 limits.

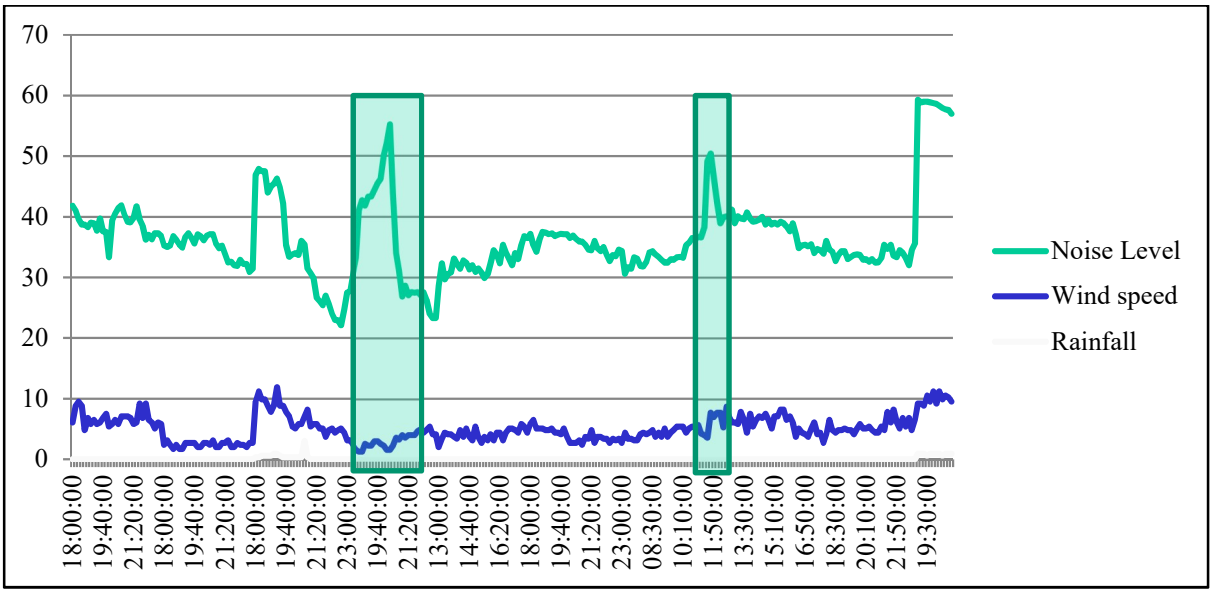

Figure 4: Extraneous noise sources impacting background noise levels

The most flagrant disregard for the ethics of undertaking a robust noise impact assessment related to the positioning of the background noise level microphone within the centre of a hedgerow, as presented in Figure 5. When the wind blew, branches physically rubbed against the single skinned windshield. Upon highlighting these observations to the acoustic consultant, they still submitted their report with no cognisance given to very high background noise levels presented. Again the Environmental Health Service came under considerable pressure to accept the presented background noise levels.

Figure 5 – Inappropriate microphone location

4. Post the IOA GPG publication – Planning appeal decisions

Further to the publication of the IOA GPG a number of planning appeals specifically made reference to the IOA GPG in finding in favour of the Environmental Health Service position.

4.1 2012/A0186 – Cumulative noise impacts

The Commissioner gave weight to the Environmental Health Service's arguments that when considering which additional wind energy developments should form part of a cumulative assessment, this should be based on whether or not those additional wind energy developments are predicted to be within 10dB of the currently wind farm proposal. The applicant in this instance based the inclusion or otherwise of additional wind energy developments on a set separation distance as opposed to predicted noise levels. *"A fully compliant noise assessment should be demonstrated before planning permission is granted. It would not be appropriate to attach a negative condition to the effect that no development should take place until a noise impact assessment has been presented to and agreed on by the Department because there is no guarantee that such an assessment would not show that the noise impact would be unacceptable."*

4.2 2012/A0312 – Planning conditions

Even with the publication of the IOA GPG, a number of applicants resisted the imposition of planning conditions which required that noise from the proposed wind energy development be controlled to the applicant's own predicted noise levels and required the applicant to hire an independent acoustic consultancy if a complaint was received to measure the noise impact. Whilst such conditions are common place in Great Britain, in Northern Ireland, the Planning Appeals Commission initially agreed that the imposition of such conditions was not justified. However, detailed arguments were

forwarded by the Environmental Health Service during appeal 2012/A0312 which resulted in a positive outcome. *"The appellant rightly points out that the Commission has rejected the use of this type of condition in the past. However, the evidential context of this appeal is different given the examples of its use in other jurisdictions, the support from the industry body for it and the detailed evidence of problems in gathering the data necessary to establish the validity of a complaint. I cannot see how a breach of condition notice could be served with no evidence of an actual breach having first been obtained. I consider that it is timely for the Commission's approach to this issue to be re-appraised. I am persuaded in the circumstances of this case that such a condition is necessary and reasonable."*

4.3 2013/A0169 - Headroom

Historically in Northern Ireland, noise impact controls were not conditioned by the Planning Service for all development types, with wind farms being no different. When applicant's wish to develop wind farms in proximity to these existing unconditioned wind farms, this can raise concerns with the Environmental Health Service due to the uncontrolled nature of noise impacts from these existing unconditioned wind farms. Whilst applicants can predict the noise impact from these existing unconditioned wind farms, there can be dispute over historic sound power level data and issues over potential increases in noise due to wear and tear. *"…there is nothing to prevent the existing wind farms making as much noise as they like, and the Department would have no locus to investigate the issue never mind consider enforcement action … it also needs to be borne in mind that as they age turbine mechanics have the potential to become noisier … it is unsafe to assume that the existing turbines operate in conformity with their informatives, and they have the capacity to breach the ETSU-R-97 daytime upper amenity hours noise criterion of 40dB by themselves. In essence in terms of the limits there is no headroom available to allow the appeal proposal to proceed … it can only be concluded that the proposal would have an additional adverse impact on the existing noise environment and sensitive receptors within it."*

4.4 2011/A0227 – noise calculation inputs and background measurements

Background noise levels in this instance were undertaken using an inappropriately specified wind shield which resulted in background noise levels being elevated due to the impact of wind directly on the microphone, with no consideration of rain impacts. No account of potential wind shear effects, no correction for uncertainty factors with respect to sound power level data relied upon and no consideration of tonality. *"Given all of my conclusions above I agree with the Department that the appellant has failed to present a robust and reliable NIA. Consequently he has failed to demonstrate that there would be no adverse impact by virtue of noise on the identified sensitive receptors."*

4.5 2013/A0228 – noise sensitive receptor

Within many rural localities across Northern Ireland there are a number of derelict dwellings in various states of repair. It had been the case that such derelict dwellings were required to be considered within noise impact assessments, but clarification was provided by the Planning Appeals Commission, *"… the property … is some 581 metres north of turbine T1 is in a state of dereliction and could not be inhabited in its current state. In accordance with the definition for the purpose of what is a sensitive receptor which is defined as a 'habitable residential property' I accept the view of the EHO that this property is not a sensitive receptor in respect of the noise assessment of the proposal. It is therefore not necessary to include this property within the noise assessment."*

5. The future – further work

The publication of the Amplitude Modulation Working Group – Final Report and the supporting Wind Turbine AM Review paper has presented new challenges to the Environmental Health Service. Principally the omission within the suggested AM planning condition with respect to the number of 10-minute breaches that would be deemed unacceptable and that the AM methodology only applies

to wind turbines with a blade passing frequency of no greater than 1.6Hz. As noted above, there are a large number of refurbished older wind turbines in Northern Ireland that would have a blade passing frequency of greater than 1.6Hz. The Environmental Health Service are currently reviewing amendments to the AM methodology that will allow consideration of turbines with a blade passing frequency of greater than 1.6Hz.

Given the significant number of wind farm and single wind turbine proposals/permissions in Northern Ireland, it is uncommon for noise impact assessments not to require consideration of cumulative noise impacts. The legacy of no planning conditions or conditions to full ETSU-R-97 limits have the potential to cause significant delays in the planning process due to cumulative assessment methodologies and assumptions. Further clarity around how such scenarios would greatly assist all stakeholders.

6. Conclusion

The IOA GPG has been viewed in Northern Ireland as significantly improving the robustness of wind energy noise impact assessments. It has also provided greater certainty to wind energy developers, as if followed, noise is unlikely to be a determining factor in application considerations.

The Environmental Health Service in Northern Ireland have pooled resources to purchase wind speed measurement equipment to permit independent background noise level surveying, as well as noise modelling software to enable detailed review of presented wind energy noise impact predictions. This has improved the robustness of the Environmental Health Service's consultation responses and in turn improved the quality of submitted assessments.

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