Galileo 03 Ltd.

Mynydd Ty-talwyn Energy Park - Environmental Statement Volume III

Appendix 9.2: Legislation, Policy and Guidance

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The Control of Pollution Act (CoPA)

The Control of Pollution Act10 (CoPA) 1974 provides information as to the need for ensuring that the "best practicable means" are employed to minimise noise.

Planning Policy Wales Edition 12 (Feb 2024)

Planning Policy Wales (PPW 12) sets out the land use planning policies of the Welsh Government. It is supplemented by a series of Technical Advice Notes (TANs), Welsh Government Circulars, and policy clarification letters, which together with PPW provide the national planning policy framework for Wales.

When considering the issue of Development Management and Renewable and Low Carbon Energy, PPW 11 states "*Planning authorities should also identify and require suitable ways to avoid, mitigate or compensate adverse impacts of renewable and low carbon energy development. The construction, operation, decommissioning, remediation and aftercare of proposals should take into account:*

- *The need to minimise impacts on local communities, such as from noise and air pollution, to safeguard quality of life for existing and future generations;*
- *The impact on the natural and historic environment;*
- *Cumulative impact…;"*

The issue of noise from developments is considered in Section 6.7 Air Quality and Soundscape. It states: "*In proposing new development, planning authorities and developers must, therefore:*

- *Address any implication arising as a result of its association with, or location within, air quality management areas, noise action planning priority areas or areas where there are sensitive receptors;*
- *Not create areas of poor air quality or inappropriate soundscape; and*
- *Seek to incorporate measures which reduce overall exposure to air and noise pollution and create appropriate soundscapes".*

New energy developments are considered in paragraph 6.7.15, where it states "*For the purposes of this section, potentially polluting development includes commercial, industrial, energy and agricultural or transport infrastructure. Such development should be located in areas where there is low potential for public exposure, or where its impact can be minimised. Novel or new development types may potentially cause pollution and should be carefully considered, and where appropriate, decisions should be based on the precautionary principle*." Further to this, there is a footnote to this section states the following with respect to noise from wind farm developments "*Further guidance on wind turbine noise assessment can be found in ETSU-R-97*[1] *and further good practice guidance published by the Institute of Acoustics*[2]"

Paragraph 6.7.16 goes on to outline "*Relevant considerations in making planning decisions for potentially polluting development are likely to include:*

- *Location, including the reasons for selecting the chosen site itself;*
- *Impact on health and amenity; and*
- *Effect of pollution on the natural and built environment and the enjoyment of areas of landscape and historic and cultural value …"*

[1]https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/49869/ETSU_Full_copy__Searchable_.pdf
[2] https://www.ioa.org.uk/publications/wind-turbine-noise

Technical Advice Note 11: Noise (October 1997)

Technical Advice Note 11 (TAN 11) provides technical advice and guidance to support planning policy in PPW 11 relating to air quality, noise and soundscape. Paragraph 1 of TAN 11 states "*This Technical Advice Note (Wales) (TAN) should be read in conjunction with 'Planning Guidance (Wales): Planning Policy'. Planning Guidance, Technical Advice Notes and circulars should be taken into account by local planning authorities in Wales in the preparation of development plans. They may be material to decisions on individual planning applications and will be taken into account by the Secretary of State and his Inspectors in the determination of called-in planning applications and appeals*."

With regards to noise generated through the operation of wind turbines, Annex B: The Assessment of Noise from Different Sources when considering the issue of wind turbine sound states "*B19. Detailed guidance on noise from wind turbines is contained in Planning Guidance (Wales), Technical Advice Note (Wales) 8, 'Renewable Energy', Welsh Office, 1996, Annex A, paragraphs A28-A38*."

Designing for Renewable Energy in Wales, November 2023

This guidance document sets out the key design objectives and considerations for the sensitive development of large-scale onshore wind and solar farms as well as ancillary development in Wales. This document updates and expands on the previous Designing Wind Farms in Wales 2014 good practice guidance, published by the Design Commission for Wales.

Section 5.4 Local Environmental Impacts states "*Wind turbine design layouts should demonstrate that care has been taken to screen local communities from unacceptable environmental impacts, including noise from turbines and generators*".

Section 5.9 refers specifically to noise generated through the operation of wind turbines and states "*Irrespective of location or scale, the design and micro-siting of wind turbines must seek to minimise their noise impact, particularly where turbines would be near homes and tourism receptors."* It also states that the Welsh Government has endorsed the current UK wind turbine assessment guidance as set out in ETSU-R-97, a Good Practice Guide on the application of ETSU-R-97, and Supplementary Guidance Notes.

Future Wales: The National Plan 2040

Policy 18 of The National Plan 2040 refers to Renewable and Low Carbon Energy Developments of National Significance. Criteria 7 of this policy states that new developments will be permitted where there are no unacceptable adverse impacts relating to noise. It also states, "*The cumulative impacts of existing and consented renewable energy schemes should also be considered*."

Should the noise generated from the Proposed Development, including that of any cumulative noise generated from all nearby wind farms, keep within the relevant noise targets referred in the national guidance (i.e. those stated in ETSU-R-97), then it can be considered that no adverse noise impacts would arise.

ETSU-R-97, The Assessment and Rating of Noise from Wind Farms

ETSU-R-97, The Assessment and Rating of Noise from Wind Farms, presents the findings and recommendations of a Working Group on wind turbine noise. The Working Group was set up in 1993 by the Department of Trade and Industry (DTI) and comprised of experts on wind turbine noise, wind farm developers, members of the DTI and local council Environmental Health Officers. In 1996 the group published the ETSU-R-97 report. The report describes a framework for the measurement of wind farm noise and suggested noise targets, offering a reasonable degree of protection for noise sensitive receptors.

The report recommends "*The variation in background noise level with wind speed will be determined by correlating L_{A90} noise measurements taken over a period of time with the average wind speeds measured over the same 10-minute periods and then fitting a curve to these data*."

Noise targets are set over two time periods, quiet daytime and night-time. Quiet daytime periods are defined as all evenings 6pm to 11pm, Saturday afternoons from 1pm to 6pm and all-day Sunday from 7am to 6pm. The noise limit for quiet daytime periods is 35 – 40 dB L_{A90} or 5 dB above the prevailing quiet daytime

background noise level, whichever is greater. The value between 35 - 40 dB depends on a range of factors; how many receptors are in the vicinity, the effect of noise targets on the power generated in kWh and the duration and level of exposure.

Night-time periods are defined as 11pm until 7am with a noise limit of 43 dB L_{A90} or 5 dB above the prevailing night-time background noise level, whichever is greater. The lower limit of 43 dB is based on a sleep disturbance criterion of 35 dB, with an allowance of 10 dB for attenuation through an open window, minus 2 dB to account for the use of $L_{A90,10min}$ rather than $L_{Aeq,10min}$.

ETSU-R-97 also recommends that tonal penalty should be applied to the predicted noise levels of the wind turbines where any audible tone is present. As shown on page 10 of executive summary, the level of the penalty depends how much the tone exceeds audibility.

For scenarios where there are multiple wind farms in the vicinity, ETSU-R-97 specifies that noise targets and margins above background should relate to the cumulative effect of all wind farms that contribute to the overall turbine noise for receptors. Therefore, existing wind farms should not be included as part of the prevailing background noise levels.

A Good Practice Guide to the Application of ETSU-R-97

In May 2013 the Institute of Acoustics (IOA) published the document 'A Good Practice Guide to the Application of ETSU-R-97 for the Assessment and Rating of Wind Turbine Noise' (GPG). On the Welsh government website under the guidance section for assessing wind turbine noise, it states "*We encourage the use of the Institute of Acoustics good practice guide on wind turbine noise assessment*".

In Section 1.2.1 of the document, it states "*This guide presents current good practice in the application of the ETSU-R-97 assessment methodology for all wind turbine developments above 50 kW, reflecting the original principles within ETSU-R-97, and the results of research carried out and experience gained since ETSU-R-97 was published. The noise targets in ETSU-R-97 have not been examined as these are a matter for Government*".

The GPG expands on issues raised in ETSU-R-97 as well as providing additional guidance for noise prediction, cumulative noise impacts, compliance measurements and suggested methodology with regards to dealing with wind shear.

BS 4142:2014+A1:2019

British Standard 4142:2014+A1:2019 'Methods for rating and assessing industrial and commercial sound' describes the methods for rating and assessing noise from industrial or commercial sources. The standard is applicable to the assessment of sound affecting residential receptors, through the determination of a specific level of an industrial or commercial noise source.

Where certain acoustic features are present at the assessment location, a character correction should be applied to the specific sound level to give the rating level to be used in the assessment. Acoustic features can include tones, impulsivity, intermittency or a type of noise that is distinct from the existing noise environment.

The assessment of the impact from a commercial or industrial sound can be carried out as follows:

- A difference of around +10 dB or more, between the rating and background noise levels, is likely to be an indication of a significant adverse impact, depending on the context;
- A difference of around +5 dB is likely to be an indication of adverse impact depending on the context; and
- Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact depending on the context.

1BS 5228-1:2009+A1:2014

BS 5228-1:2009+A1:2014 'Code of practice for noise and vibration control on construction and open sites. Noise' sets out techniques to predict and assess the likely noise effects from construction works, based on detailed information on the type and number of plant items being used, their location and the length of time they are in operation. The standard provides example thresholds for the assessment of the significance of noise effects.

Annex E of BS 5228 provides guidance on how to assess the significance of construction noise. Section E.3.2 details the ABC Method, applicable to residential receptors, duplicated below:

Assessment category and threshold value period	Threshold value, $L_{Aeq,T}$ (dB)		
	Category A [A]	Category B [B]	Category C [C]
Night-time (23:00-07:00)	45	50	55
Evening and weekends [D]	55	60	65
Daytime (07:00-19:00) and Saturdays (07:00-13:00)	65	70	75

[A] Category A used when ambient noise levels (when rounded to the nearest 5dB(A)) are less than these values.

[B] Category B used when ambient noise levels (when rounded to the nearest 5 dB) are the same as the category A values.

[C] Category C used when the ambient noise levels (when rounded to the nearest 5 dB) are higher than category A values.

[D] 19.00 – 23.00 weekdays, 13.00-23.00 Saturdays and 07.00 – 23.00 Sundays.

Notes

[Note 1] A significant effect has been deemed to occur if the L_{Aeq} noise level arising from the Site exceeds the threshold level for the category appropriate to the ambient noise level.

[Note 2] If the ambient noise level exceeds the threshold values given in the table (i.e. the ambient noise levels is higher than the above values), then a potential significant effect is indicated if the total $L_{Aeq,T}$ noise level for the period increases by more than 3 dB due site noise.

[Note 3] Applied to residential receptors only.

Table 2 Threshold of significant effect at dwellings (BS 5228 Table E.1)

BS 5228-2:2009+A1:2014

Annex B of BS 5228-2:2009+A1:2015 'Code of practice for noise and vibration control on construction and open sites. Part 2: Vibration' gives guidance on the significance of vibration effects in terms of human response to vibration and structural response to vibration.

Vibration level (PPV)	Effect
0.14 mm/s	Vibration might be just perceptible in the most sensitive situations for most vibration frequencies associated with construction. At lower frequencies, people are less sensitive to vibration
0.3 mm/s	Vibration might be just perceptible in residential environments

Vibration level (PPV)	Effect
1.0 mm/s	It is likely that vibration of this level in residential environments will cause complaint, but can be tolerated if prior warning and explanation has been given to residents
10 mm/s	Vibration is likely to be intolerable for any more than a very brief exposure to this level

Table 3 Guidance on effects of vibration levels perceptible to humans

Type of building	Peak component particle velocity in frequency range of predominant pulse	
	4 Hz to 15 Hz	15 Hz and above
Reinforced or framed structures Industrial and heavy commercial buildings	50 mm/s at 4 Hz and above	5 0 mm/s at 4 Hz and above
Unreinforced or light framed structures Residential or light commercial buildings	15 mm/s at 4 Hz increasing to 20 mm/s at 15 Hz	20 mm/s at 15 Hz increasing to 50 mm/s at 40 Hz and above

Table 4 Transient vibration guide values for cosmetic damage in structures

ISO 9613-2

International Standard: ISO 9613-2: 2024: 'Acoustics - Attenuation of sound during propagation outdoors - Part 2: Engineering method for the prediction of sound pressure levels outdoors' enables the prediction of noise levels in the community from sources of known sound emission.

The noise prediction method described in this part of the standard is general and is suitable for a wide range of engineering applications where the noise level outdoors is of interest. The noise source(s) may be moving or stationary and the method considers the following major mechanisms of noise attenuation:

- Geometrical divergence (also known as distance loss or geometric damping);
- Atmospheric absorption;
- Ground effect;
- Reflection from surfaces; and
- Screening by obstructions, barriers and buildings.

The method predicts noise levels under metrological conditions favourable to noise propagation from the sound source to the receiver, such as downwind propagation, or equivalently, propagation under a moderate ground-based temperature inversion as commonly occurs at night.

Amplitude Modulation (AM)

Characteristics

Amplitude modulation (AM) wind turbine sound involves periodic variations in the sound level of the broadband spectrum of aerodynamic sound. It is characterized by **modulation depth** (the range between peak and trough sound levels) and **modulation frequency** (the number of peaks or troughs per second). AM can vary across the frequency spectrum, with "swishing" sounds typically associated with modulation in higher frequency bands (e.g., 500-1500 Hz).

Two categories of AM are distinguished:

- **TEDCAR-AM** (trailing edge directivity and convective amplification-related AM, also known as 'blade swish'); and
- **non-TEDCAR-AM** (other, enhanced, or abnormal AM). Non-TEDCAR-AM can be prominent at longer ranges, have a lower frequency, and vary with wind direction.

Effects of AM

A wide range of complex interacting factors can influence AM generation and character. Annoyance responses are influenced by AM characteristics in wind turbine sound, and AM may be the most annoying characteristic of wind turbine sound.

AM prevalence is typically greater at night, which, combined with the higher minimum limit, means overall night-time impacts could be increased compared with daytime.

Guidance on the Assessment of AM

Guidance within ETSU-R-97 identifies that amplitude modulation is characteristic of wind turbine sound, and that its presence increases the distinctiveness of wind turbine sound against residual sounds. The ETSU-R-97 guidance does not adequately address the adverse impact of AM, which increases noise annoyance and is an expected characteristic of wind turbine sound emissions.

Assessment of AM (pre-construction)

Presently, amplitude modulation cannot be assessed pre-construction of a wind farm. Therefore, the assessment can only be conducted once the development is operational. Supporting information regarding its limitation is provided within the IOA GPG and the 2023 Review of Noise Guidance for Onshore Wind Turbines undertaken by WSP for the Department for Business, Energy & Industrial Strategy (BEIS)3. It is noted that predictions of AM in the context of development planning and noise assessment guidance are unlikely to be practically feasible in the near future.

Rating and Assessment of AM (operation)

In 2016 the IoA published 'A Method for Rating Amplitude Modulation in Wind Turbine Noise'. The report and recommended methodology are based on a review of several methods for rating AM in wind turbine noise conducted by the Amplitude Modulation Working Group (AMWG).

The IoA Reference Method[3] is considered to be a robust and practical general-purpose approach to quantifying AM within large datasets and has been applied and tested in research studies. The IoA Reference Method provides a methodology to assess and rate the level of AM from operational wind farms, and does not aim to quantify the level at which AM could lead to disturbance.

A penalty control scheme has been proposed that addresses both AM depth and modulation frequency and employs the IoA Reference Method to quantify AM[4]. Post-completion assessment of AM can be undertaken

[3] IOA Noise Working Group (Wind Turbine Noise) Amplitude Modulation Working Group, A Method for Rating Amplitude Modulation in Wind Turbine Noise, 2016

[4] Lotinga, M, & Lewis, T, 2021. Subjective responses to wind turbine noise amplitude modulation: Pooled analysis of laboratory listening studies and synthesis of an AM character rating penalty. Wind Turbine Noise 2021, 18-21 May, Remote from Europe. INCE-Europe.

should this aspect of turbine noise be deemed to be excessive by the Local Authority, following a verified noise complaint.

Low Frequency Noise and Infrasound

Wind turbines produce noise, including Low Frequency Noise (LFN), that decreases with distance from the wind turbines. LFN extends down to the infrasound region but the boundaries between infrasound and LFN are not well defined and best described as 'fuzzy'[5].

The 2023 Review of Noise Guidance for Onshore Wind Turbines undertaken by WSP for the Department for Business, Energy & Industrial Strategy (BEIS)[3], provides within it a recent review of studies relating to the potential health effects of low-frequency noise from wind turbines. We provide the following summary, with specific reference to LFN.

General Findings

Reviews suggest that the effects of exposure to low frequency sound from wind turbines are currently limited to annoyance at typical exposure levels. Disturbances reported in a UK study were more likely to be due to audible AM rather than low frequency sound.

There remains no compelling evidence of adverse health effects associated with wind turbine infrasound exposure at sound frequencies and levels expected to be present at noise-sensitive receptor locations in the vicinity of wind farms[6].

Any adverse health effects from low frequency sound or infrasound are highly unlikely at typical wind turbine sound levels.

Low-frequency sound is part of the sound emitted by wind turbines and has the same kind of effects that normal sounds have; some people will find it annoying, which may have some consequent effects on sleep and chronic annoyance that could potentially lead to other health outcomes. This is also the case for sound emitted by other common environmental sources, including aircraft, road traffic or railways[7].

Vibration

In 1997 ETSU undertook a comprehensive study in the UK of ground borne vibration from the operation of a modern wind farm. Measurements were taken on site and up to 1 km away from the turbines. The study found that vibration measurements taken at 100 m from the nearest turbine were a factor of 10 less than those recommended for human exposure in critical working areas, such as laboratories used for precision measurement. It also found that tones above 3.0 Hz were found to attenuate rapidly with distance, i.e., the higher frequencies attenuating at a progressively increasing rate.

Given the large separation distance from the nearest proposed turbine to receptor (>300 m), it can be considered that vibration caused by the operation of the Proposed Development will have a negligible impact on nearby receptors.

[5] Low Frequency Noise (LFN) Annoyance, Institute of Acoustics Briefing Note January 2024 Briefing Note
[6] van Kamp, I & van den Berg, F, 2021. Health effects related to wind turbine sound: An update. International Journal of Environmental Research and Public Health, 18 (17), 9133.
[7] A Review of Noise Guidance for Onshore Wind Turbines, 2023. for the Department for Business, Energy & Industrial Strategy (BEIS), WSP.

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