



APPENDIX 3

TNEI RESPONSE

Clonberne Wind Farm: Response to Submissions (Noise)



MKO Ireland

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1 Introduction

This report has been produced as part of the request for Further Information (FI) from An Coimisiún Pleanála in respect of the proposed 11 turbine Clonberne Wind Farm (PA07.320089). The report provides responses to submissions received (the Submissions) in respect of the potential for operational and construction noise and vibration associated with the Proposed Development.

Submissions have been considered for both the proposed Wind Farm development and the proposed Grid Connection development. For each development, the submissions have been grouped as either responses from statutory bodies, or responses from other stakeholders, which includes those submissions made by members of the public.

The report addresses the submissions received in respect of noise and vibration only.

1.1 Overview of Submissions

1.1.1 Submissions from Statutory Bodies.

Seven submissions were received from Statutory Bodies in respect of the proposed Wind Farm. Of these, only one refers to noise, which is the National Environmental Health Service (NEHS) Submission. No submissions refer to vibration.

Three submissions were received from Statutory Bodies in respect of the proposed Grid Connection. Of these, one refers to noise and vibration, which is the Galway County Council (GCC) Submission.

TNEI's response to these submissions are included as Section 2.1 and Section 2.2.

1.1.2 Submissions from Other Stakeholders

184 submissions were received from other stakeholders in respect of the proposed Wind Farm. The majority of these are from individuals who live in the vicinity of the proposed development. TNEI's response to these submissions are included as Section 3.1 to 3.7.

Four submissions were received from other stakeholders in respect of the proposed Grid Connection. Three of these present views from North East Galway Environmental Protection CLG, and one submission is from a local resident. One of the North East Galway Environmental Protection CLG submissions refers to noise and vibration from construction activities, and TNEI's response to this is included within Section 3.8. The submission from the local resident refers to noise from the operation of the proposed Wind Farm, rather than the proposed Grid Connection, and this has been covered within the previous wind farm related response.

1.2 Overview of the EIAR Noise Assessment

This section provides an overview of the noise assessment methodology that was adopted within Chapter 12 of the EIAR. It is useful to detail this here, as reference is made to these standards and guidance throughout this report.

- The operational noise assessment methodology is as described in ETSU-R-97 *The Assessment and Rating of Noise From Wind Farms* (ETSU-R-97) [1] and supplemented with the guidance presented in the Institute of Acoustics' *A Good Practice Guide to the Application of ETSU-R-97 for the Assessment and Rating of Wind Turbine Noise* (the IOA GPG) [2].



- The prediction of noise from the operation of the wind turbines is undertaken in accordance with ISO 9613-2 *Acoustics — Attenuation of sound during propagation outdoors* [3], with additional modifying factors as detailed within the IOA GPG.
- The assessment of operational noise is made against noise level limits derived from the noise limit criteria defined in the Wind Energy Development Guidelines (WEDG2006) [4].
- The construction noise assessment methodology follows the guidance in BS 5228-1 *Code of practice for noise and vibration control on construction and open sites - Noise* [5] and noise is assessed against the threshold levels presented in this document.
- The prediction of noise from construction activities is undertaken in accordance with ISO 9613-2.

Chapter 12 of the EIAR presents an EIA assessment of the likely significant effects. This includes an assessment of construction and operational noise. Separately, a construction noise impact assessment and an operational noise impact assessment are provided as Technical Appendix 12-1 Construction Noise Report and Technical Appendix 12-2 Operational Noise Report. The technical appendices are used to inform the assessment presented in Chapter 12 and contain much more technical detail in respect of data collection and analysis, noise level predictions and assessment methodology.

2 Response to Statutory Bodies

2.1 Response to National Environmental Health Service Submission

The NEHS Submission (in respect of noise) can be split into two parts.

The first part, titled *Project Specific Guidance for Wind Energy Development*, is generic in nature i.e. it does not refer specifically to the Proposed Development. Rather, it could be applied to all wind turbine developments. The text provides some commentary regarding guidance that can be referred to when assessing the potential for health effects from operational wind turbine noise.

The second part of the NEHS Submission, titled *Likely Significant Effects from Noise and Vibration*, provides some specific commentary in respect of the Proposed Development, and refers to the noise impact assessment included as Chapter 12 of the Environmental Impact Assessment Report (EIAR).

2.1.1 NEHS Submission – ‘Project Specific Guidance for Wind Energy Development’

The NEHS Submission states that the current guidelines for wind energy development are the 2006 Wind Energy Development Guidelines (WEDG 2006) but goes on to note that since the publication of those guidelines the nature of wind turbine development has changed e.g. larger turbines, cumulative effects etc. It also states that there have been “substantial increases in the body of knowledge around the likely significant effects of the operation of wind farm development on Population Health, in particular around the characteristics of the noise emissions and health effects of shadow flicker”, however, no specific reference is made to this additional knowledge and how it should be considered - though it is noted that World Health Organisation (WHO) publications are referred to in Part 2 of the Submission (addressed below).

The Submission then refers to the 2019 Draft WEDG [6], which were published for consultation in 2019 but are yet to be adopted, however, it is not clear whether NEHS is supportive or not of the use of Draft WEDG 2019.

Finally, the Submission refers to the High Court decision in *Webster/Rollo v Meenaclogher (Wind) limited (2014 IEHC 136) 8th March 2024* [7]. This was a private nuisance case in respect of noise received at a dwelling from the operation of a nearby wind turbine development. NEHS note that the judge stated that she could consider nuisance irrespective of any compliance with consent conditions. Whilst this is true, it is nothing new, and TNEI recognise that compliance with a set of conditioned noise limits is not usually sufficient on its own to demonstrate that no nuisance is present. This is the case for all noise generating developments, not just wind turbines. Care needs to be taken, however, not to confuse nuisance with the planning regime, which is what is of concern here.

Nuisance and planning operate under completely different legal frameworks and what is relevant here is the planning system, not nuisance, although the following is noted from the NEHS submission, which states (in respect of the High Court Decision);

‘the judgement is clear in paragraph 277 that consent decisions for development based on strong rationale and consideration of best practice are more likely to be considered reasonable protection from nuisance than those where “for example the planning permission is opaque in its rationale, where the science in the area has moved on since the grant of permission or where the particular matter complained is incompletely regulated by the permission (paragraph 277)”.

In this regard we would note that the assessment of operational noise for the Proposed Development has been undertaken in accordance with recognised best practice and with due regard to the latest science. This is discussed in detail in Section 2.1.2.

2.1.2 NEHS Submission – ‘Likely Significant Effects from Noise and Vibration’

Part 2 of the Submission is split out into eight paragraphs denoted as *a-h*. These are replicated below (blue text in italics) followed by a TNEI response, where necessary.

- a) The 2006 guidelines include guidance on how to derive noise limits for daytime and night-time periods, which can be summarised as: daytime limits take account of existing background noise levels and include a fixed limit of 45 dB, or background +5dB, whichever is the greater, except in low background noise environments where a fixed minimum limit in the range of 35-40 dB should be considered. It is noted that the EIA has used the upper limit of 40 dB for evaluation of significance.*
- b) This criteria is therefore that turbine noise at noise sensitive locations should not exceed for daytime periods: 40 dB(A) where background noise levels are below 30 dB; and 45 dB(A_ or background noise plus 5 dB, whichever is the greater, where background noise levels are greater than 30.*

TNEI Response: The principal of WEDG 2006 is to start from a position of setting a fixed noise limit (generally 45 dB(A)), however, a limit of background noise level + 5 dB can be used in higher noise environments. In this regard the WEDG 2006 states; *“In general, a lower fixed limit of 45 dB(A)10min or a maximum increase of 5dB(A) above background noise at nearby noise sensitive locations is considered appropriate to provide protection to wind energy development neighbours.”*

As detailed above, when the existing noise environment is very quiet then a lower fixed level limit can be used, to be set between 35 dB (A) and 40 dB (A).

- c) This can potentially see a predicted increase of up to 15 dB(A) change in the noise environment as compliant with the criteria. Any change in the noise environment of this magnitude is highly likely to cause complaints and/or nuisance. BS 4142:2014+A1:2019 Methods for Rating and Assessing Industrial and Commercial Sound identifies an increase of 10 dB above the existing rated noise levels will have a significant adverse impact and is highly likely to cause complaints.*

TNEI Response: This is an incorrect assumption and an oversimplification of BS 4142 [8], which employs a two-stage assessment process. Initially, an estimate of the impact is made by subtracting the measured Background Sound Level from the calculated or measured Rating Level. The second part of the assessment is to then consider the context in which the sound occurs, which can modify the findings of the initial estimate. The reference to *“an increase of 10 dB ...”* is in respect of the Stage 1 assessment i.e. the NEHS Submission only considers the first stage of the assessment process and completely disregards the second stage of the assessment, which considers, amongst other things, the absolute level of sound.

In respect of absolute level of sound, BS 4142 suggests that in instances where the existing sound environment is considered either particularly low (below 30 dBA), or particularly high, then absolute levels may be more relevant, which would modify the initial estimate of impact. The standard states:

“Where background sound levels and rating levels are low, absolute levels might be as, or more, relevant than the margin by which the rating level exceeds the background. This is especially true at night.” This is the approach that both the WEDG 2006 and ETSU-R-97 takes, through the setting a fixed lower-level limit for locations with low background noise levels.

Regardless, BS 4142 is not an appropriate assessment method for evaluating wind turbine noise and a number of pages are given over to this within the ETSU-R-97 document, under the heading; *‘Problems with interpretation and the literal application of BS 4142’*.

It is acknowledged that the ETSU document refers to an older version of BS 4142 than the version currently in use, however, with reference to the most recent release, BS 4142:2014+A1:2019, the following should also be noted;



- The Standard is intended for the assessment of noise at low wind speeds, however turbine noise increases proportionately with wind speed and it is at wind speeds above the range of those considered in BS 4142 that a wind farm noise assessment is centred around.
- There is no method to set noise level limits in BS 4142, the standard simply provides a mechanism to determine whether there may be an adverse noise impact for noise generating developments or noise sensitive developments that fit within the scope of the standard; and,
- BS 4142 itself states at 1.3; "*The standard is not intended to be applied to the rating and assessment of sound from: a, b, c, ... h) other sources falling within the scopes of other standards and guidance.*" In this case wind turbines fall 'within the scope of other standards and guidance', namely ETSU-R-97 The Assessment and Rating of Noise from Wind Farms and WEDG 2006.

Accordingly, no further consideration of BS 4142 is considered necessary.

d) The evaluation of significance of an effect is based on the most up to date scientific knowledge and data. The EIA process specifically requires the assessment to be 'the likely significant effects' and if the knowledge on an evaluation criteria of significance has developed since the publication of a guidance, then it is reasonable and correct to use the developed knowledge base in assessing the significance of any effect. This is particularly relevant to the protection of public health. Statutory Guidance issued under the Planning Development Act 2000 (as amended) has to be considered by the Planning Authority when making a decision, but it is not a consideration that precludes all other evidence and knowledge.

TNEI Response: The assessment has been undertaken in accordance with Wind Energy Development Guidelines (WEDG) 2006, which is the current guidance in effect in Ireland. However, whilst the WEDG 2006 sets out the noise level limit criteria, the actual assessment method is based on the application of ETSU-R-97 and the associated IOA GPG, which represents current best science.

ETSU-R-97 is still very much in use today in all countries of the UK, and to inform WEDG 2006 assessments in Ireland, and it is still relevant. The UK Government has been considering the extent to which ETSU-R-97 may require updating and a report produced for the (former) UK Government Department for Business, Energy & Industrial Strategy (BEIS) was published on 10th February 2023 (the WSP BEIS report [9]), which provided some recommendations. The UK government has now acted on these recommendations by commissioning an update to ETSU-R-97, however, it is unclear when any updated guidance would be finalised or how it would be implemented.

An initial consultation period for the update to ETSU-R-97 (referred to as Assessment and Rating of Wind Turbine Noise 2025) has recently ended (August 2025) however, it should be noted that the consultation document states: "*This draft guidance update does not represent a final position from government. It should not be used by local planning authorities during or after the consultation period in relation to ongoing planning applications. Following this consultation, we will analyse responses and issue a formal government response. Until this time, the current guidance remains suitable for assessing wind turbine noise. Planning authorities should continue to use existing guidance and are advised not to delay planning decisions on the basis of this consultation.*"

In 2013 the Institute of Acoustics (IOA) published 'A Good Practice Guide to the Application of ETSU-R-97 for the Assessment and Rating of Wind Turbine Noise' (IOA GPG), to set out best practice methodology. This document has been endorsed by all UK governments. For example, the Scottish Government document 'Onshore Wind Turbines: Planning Advice' [10] states that the IOA GPG, "*should be used by all IOA members and those undertaking assessments to ETSU-R-97. The Scottish Government accepts that the guide represents current industry good practice.*"

It is also noted that the Scottish Government 'Onshore Wind Policy Statement 2022' [11] states, "*Until such time as new guidance is produced, ETSU-R-97 should continue to be followed by applicants....*"

The IOA GPG is a live document that can be updated to reflect best practice, although since publication it has not been updated and the original document still represents best available science.

The use of WEDG 2006, supported by ETSU-R-97 and the IOA GPG, is routinely used for the assessment of wind turbine noise in Ireland and continues to be used for planning applications submitted in 2025. Whether this assessment methodology is appropriate, how it is incorporated into EIA, and whether it is in keeping with the most up to date knowledge, was challenged during the planning application for the Coom Green Energy Park, a 22 wind turbine development in County Cork, Ireland [12]. The Inspector nonetheless considered the approach appropriate¹ and this was upheld when it was again challenged at a subsequent Judicial Review.

To summarise, TNEI consider the noise impact assessment methodology to represent both current national guidance and best available science.

- e) *Tabulation of the predicted change in noise environment from the proposed development and any cumulative change in the original baseline noise environment before any wind farm development is represented in table 12.12 of the EIAR. This reports that the predicted noise exposure at all NSL² is below the guidance level for it to be a significant impact except at wind speeds of 7Km [sic]³for certain NSL. It is proposed that the turbines would operate in low output mode during times that meet the specific conditions to exceed the absolute noise exposure limit.*

TNEI Response: Table 12.12 presents the total noise level from the operation of all wind turbines and compares this level against the WEDG noise limit, it does not show the 'change in noise environment' or refer to the baseline.

- f) *The NEHS would consider the most appropriate criteria for assessing significance of the predicted noise in consideration if the ENVIRONMENTAL NOISE GUIDELINES for the European Region, 2018. The 2018 WHO Guidance set health protection levels from environmental.noise.<https://iris.who.int/bitstream/handle/10665/279952/9789289053563-eng.pdf?sequence=1>*
- g) *The WHO is the most authoritative body with regards to the evidence base that sets health protection standards.*
- h) *The NEHS would consider it appropriate for the Planning Authority to use the existing noise data to carry out an assessment against the WHO 2018 Guidance noise criteria. This should include cumulative noise impacts from existing and planned wind farm development.*

TNEI Response: TNEI do not agree that the Environmental Noise Guidelines for the European Region, WHO 2018 (the WHO Guidelines) [13] are appropriate criteria for the assessment of wind turbine noise. We would also note that the WHO Guidelines only set out guideline noise levels, and do not present any assessment methodology.

The main purpose of The WHO Guidelines, as set out on page xiii is: *"to provide recommendations for protecting human health from exposure to environmental noise originating from various sources: transportation (road traffic, railway and aircraft) noise, wind turbine noise and leisure noise."*

the WHO Guidelines make recommendations in relation to each of the noise sources considered and each recommendation is rated as either 'strong' or 'conditional,' which are defined as follows:

¹ See Inspector's Report ABP-308885-20 dated 22/23 July 2021 & 6 December 2022

² No definition of NSL is given. It is assumed this means Noise Sensitive Location. The noise assessment in the EIAR uses NSR (Noise Sensitive Receptor) and NAL (Noise Assessment Location). In this case it is assumed that NSL is being used in place of NAL.

³ The reference to 7 Km, should in fact, be 7 m/s.

⁴ Note: The quoted link does not work. The WHO document (as of 4/11/25) can be found here; <https://www.who.int/europe/publications/item/9789289053563>

“A strong recommendation can be adopted as policy in most situations. The guideline is based on the confidence that the desirable effects of adherence to the recommendation outweigh the undesirable consequences. The quality of evidence for a net benefit – combined with information about the values, preferences and resources – inform this recommendation, which should be implemented in most circumstances.

A conditional recommendation requires a policy-making process with substantial debate and involvement of various stakeholders. There is less certainty of its efficacy owing to lower quality of evidence of a net benefit, opposing values and preferences of individuals and populations affected or the high resource implications of the recommendation, meaning there may be circumstances or settings in which it will not apply.”

The strength of recommendation was determined following a two-step procedure. Initially the strength of the recommendation was set as strong or conditional based on a qualitative assessment of the quality of the evidence, this was then either adopted or confirmed having due consideration to contextual parameters that might have a contributory role. There were seven additional contextual parameters, which were assessed qualitatively. The WHO Guidelines provided three strong recommendations for each of the transportation noise sources (road traffic, railway and aircraft), one strong and two conditional recommendations for leisure noise, and two conditional recommendations for wind turbine noise. Accordingly, the recommendations for Wind Turbine Noise should not be given the same weight as other recommendations detailed within the document.

The recommendations included for wind turbine noise (presented on page xvii of the Guidelines) are reproduced here as Table 2-1. It should be noted that the metrics used for quantifying noise levels throughout the WHO Guidelines are Lden and Lnigh, which are different from those used in WEDG 2006 and ETSU-R-97.

Table 2-1: WHO Environmental Noise Guideline Recommendations for Wind Turbine Noise

Recommendation	Strength
For average noise exposure, the GDG conditionally recommends reducing noise levels produced by wind turbines below 45 dB Lden, as wind turbine noise above this level is associated with adverse health effects.	Conditional
No recommendation is made for average night noise exposure Lnigh of wind turbines. The quality of evidence of night-time exposure to wind turbine noise is too low to allow a recommendation.	N/A
To reduce health effects, the GDG conditionally recommends that policymakers implement suitable measures to reduce noise exposure from wind turbines in the population exposed to levels above the guideline values for average noise exposure. No evidence is available, however, to facilitate the recommendation of one particular type of intervention over another.	Conditional

The Lden metric is an annual (day-evening-night) weighted sound pressure level. The metric, which considers annual exposure to noise, effectively gives additional weight to noise occurring during the evening and further weight to noise occurring at night. The Lden metric is commonly used for assessment of transportation noise and in strategic mapping exercises but there is no guidance in Ireland (or indeed in the WHO Guidelines) to outline how a wind farm noise Lden could be predicted or measured. There are very considerable practical difficulties involved with the use of Lden for wind farm noise and accordingly, it is very rarely used for wind turbine noise assessment.

When considering the recommendations in the WHO Guidelines it is important to consider them in the context of the entire document and there are a number of important points which are set out here;

The recommendations in the Guidelines are based on a 10% absolute risk of High Annoyance in the population. Table 36 of the Guidelines details that this is based on a review of four studies. Table 37 identified that six studies were available that considered sleep disturbance but they did not reveal consistent results about the effects of wind turbine noise on sleep. Consequently, the Guidelines do not make a recommendation on Lnight. No other studies were identified in the Guidelines that were sufficient to allow for the consideration of any other health effects.

The recommendations are 'conditional,' and such recommendations: "*requires a policy-making process with substantial debate and involvement of various stakeholders*".

Table 42 of the Guidelines, "*provides a comprehensive summary of the different dimensions for the assessment of the strength of the wind turbine recommendations.*" Within the table it states: "*Evidence for a relevant absolute risk of annoyance at 45 dB Lden was rated low quality. No statistically significant evidence was available for sleep disturbance related to exposure from wind turbine noise at night.*"

Table 42 also sets out additional context in relation to the balance of benefits versus harms and burdens, stating: "*Further work is required to assess fully the benefits and harms of exposure to environmental noise from wind turbines and to clarify whether the potential benefits associated with reducing exposure to environmental noise for individuals living in the vicinity of wind turbines outweigh the impact on the development of renewable energy policies in the WHO European Region.*"

As noted previously, the Lden metric is not currently used in Ireland for the prediction, measurement or assessment of wind turbine noise and this is also highlighted in Table 42 of the Guidelines, which states (in relation to additional considerations or uncertainties) that: "*There are serious issues with noise exposure assessment related to wind turbines.*" This is consistent with earlier text in the Guidelines (on page 84), which notes that: "*Based on all these factors, it may be concluded that the acoustical description of wind turbine noise by means of Lden or Lnight may be a poor characterization of wind turbine noise and may limit the ability to observe associations between wind turbine noise and health outcomes.*"

Whilst the Guidelines provide a useful overview of the information available relating to health effects at the time of the WHO review, the recommendations need to be considered in the context of the entire document and the Guidelines note that the quality of evidence upon which the recommendations are based is low quality. This is reflected in the fact that the recommendation is conditional, and the Guidelines note that the recommendation should be subject to a policy-making process with substantial debate and involvement of various stakeholders.

In relation to wind turbine noise assessment, no formal changes have been made to the 2006 WEDG. Similarly, the UK continues to rely on ETSU-R-97 and the IOA GPG as an appropriate method of assessment. It is also noted that the Institute of Acoustics has not made any changes to the good practice guidance set out in the IOA GPG to incorporate the WHO guidelines.

With due regards to the above, assessment of operational wind turbine noise against the levels presented in the WHO Guidelines is not considered to be appropriate or necessary.

2.2 Response to Galway County Council Submission

The Galway County Council (GCC) Submission notes the following;

1. "Population and Human health

The EIAR submitted does not identify any significant human health and population impacts arising from the proposed grid connection/substation and associated development. The planning express concerns regarding the impact of the proposed hours/days of operation during the construction stage, being 7am to 7pm Monday to Saturday, on existing residential properties in the vicinity of the construction site and haul roads, exposing existing residents to longer durations of noise and vibration than standard construction hours. This matter may be addressed through a reducing [of] the construction hours to acceptable standard hours."

Firstly, it should be noted that no vibration effects are anticipated, therefore, airborne noise effects are all that is relevant here. All further commentary in respect of this submission is in relation to noise only.

The core construction hours quoted in the submission are incorrect. Proposed construction hours, as quoted in the EIAR⁵, are 07:00 – 19:00 Monday to Friday and 07:00 – 13:00 on Saturdays.

Construction noise has been considered against the noise level thresholds presented in BS 5228-1:2009+A1:2014 *Code of Practice for Noise and Vibration Control on Construction and Open Sites – Noise*. The thresholds indicate the potential for a significant effect at a dwelling but it should be noted that exceedance of the threshold does not indicate a significant effect and additional factors also need to be considered, such as duration of exposure. For example, a slight exceedance of the threshold level may be considered not significant unless this occurs for a period of one month or more.

The weekday, daytime threshold levels in BS 5228 are based on continuous noise levels for a period of 07:00 – 19:00, which are the same as the construction hours proposed in the EIAR. It should be noted, however, that where the assessment assumes noise levels will occur continuously throughout the day, and with all plant and construction activities occurring concurrently, in reality, construction noise levels are likely to be much less than predicted for the majority of time, as plant and activities move location and vary in duration. It would be highly unlikely for an item of plant or a particular construction activity to be active continuously at a single location, apart from the use of pumps and generators, which can generally be mitigated with ease, through the use of enclosures etc.

Regardless, the predicted construction noise levels, which are presented in Table 12-9 of EIAR Chapter 12, are comfortably below the BS 5228 threshold levels for all time periods, and even if construction was being undertaken continuously between 07:00 and 19:00, no significant impact would be anticipated.

⁵ See Construction Environmental Management Plan (CEMP) Table 7.1 ref MM46 and MX35, as well as EIAR Chapter 12, Section 12.4.1 and EIAR Appendix 12.1 Section 3.2

3 Response to Third Party Submissions

Of the 184 submissions received from other stakeholders, most of these are from individuals or families living in proximity to the Proposed Development. Other submissions include those from groups and organisations including, Barnaderg Cooloo Windfarm Action Collective CLG, Wild Ireland Defence CLG, Clonberne Health and Special Needs Committee, North East Galway Protection CLG, Irish Peatland Conservation Council and a joint letter from Councillors of the Ballinasloe Municipal District Council.

Many of the submissions express concern in respect of noise, primarily from the operation of the wind turbines, though there are also some concerns raised in respect of construction noise from the proposed Wind Farm and the proposed Grid Connection. The general concerns raised in relation to noise relate to the potential for adverse health impacts, in particular from low frequency noise and/or infrasound, however, other issues have also been raised, and the following list seeks to summarise those concerns;

- The use of noise assessment standards, guidelines and legislation
- Health impacts from noise pollution
- Low frequency noise (LFN) and infrasound
- Amplitude Modulation (AM)
- Potential impacts on animals (livestock)
- Cumulative noise (from other wind farms, existing and proposed)
- Use of candidate turbine and mitigation measures
- Construction noise
- Blasting

It is noted that many of the submissions are based on a similar format and contain similar (or the same) content, however, there are some particular submissions, most notably from Clonberne Health and Special Needs Committee, that include specific questions and/or concerns that are addressed individually.

It should be noted that in many cases, the submissions relate to noise from wind turbines generally and do not focus specifically on the proposed development or raise questions in respect of the noise impact assessments submitted as part of the planning application. Where project specific questions have been raised, however, we have sought to address these.

It should also be noted that many submissions make reference to the Webster/Rollo v Meenaclogher (Wind) Limited noise nuisance case, discussed previously in Section 2.1.1 (2014 IEHC 136) 8th March 2024. This is understandable, as it was a high profile case that gained lots of media coverage. Reference to this case, however, and similar references to media reported noise issues, needs to be considered in context and with a full understanding of the facts. In that particular case, a two-turbine scheme whose nearest turbine was extremely close to the complainants' property (approximately 380 m), was found to be causing a noise nuisance. The operator did not appear to acknowledge the noise complaints over a long period of time (several years) or attempt to reduce the noise output. Most importantly (in relation to this report), the noise level limits set in the planning conditions were not set in accordance with WEDG2006, ETSU-R-97 or any other recognised guidance. Had the noise limits been set appropriately (and assuming the development complied with those limits), this would have reduced the likelihood of nuisance occurring in the first place.

It is not reasonable to assume that because a noise nuisance was found at one wind turbine development then all future turbine developments are liable to cause a nuisance. Similarly, the two developments cannot be compared, in terms of noise. Setback distances are different, turbine technology has advanced and noise mitigation measures are designed in (mode management), and the noise level limits are derived in accordance with best practice.



The following sections seek to provide an overarching response to the common themes found across the range of submissions, with, some specific submissions referred to, where appropriate.

3.1 Noise assessment standards, guidelines and legislation

Many of the submissions question whether the use of WEDG 2006 and ETSU-R-97 is appropriate for the assessment of operational noise. This has already been addressed in Section 2.1.1 and Section 2.1.2, so does not need to be discussed further here.

3.2 Health impacts from noise pollution

Many submissions present statements regarding alleged adverse health effects attributable to wind farms but these comments do not specifically address the Proposed Development. Rather, the submissions discuss wind turbines in general and the tone of many of the submissions infer that adverse health effects are likely from all wind farm developments.

Understandably, many residents are anxious and concerned about potential health impacts related to noise from the turbines, however, the fact that high levels of noise (from any noise source) may contribute to adverse health effects is not under debate here; nor is the evidence that lack of sleep as a result of noise disturbance may contribute to adverse health effects. Both of these issues are well documented, for example, in publications such as those published by the World Health Organization (WHO). What is important is not whether high levels of noise contribute to adverse health effects but how levels of noise are assessed and controlled, to remove, reduce or mitigate this risk. In this case, the assessment has been undertaken in accordance with recognised best science and the most up to date good practice. As already presented in detail in Section 2.1.2 but worth repeating here, it is not appropriate to assess wind turbine noise against the WHO Guidelines published in 2018.

Particular concern has been raised in respect of low frequency noise and infrasound, and this is addressed separately in Section 3.3, as it features in many of the submissions.

Concerns have been raised regarding the ability for wind turbine noise to affect nearby residents with Autism Spectrum Disorders (ASD). This is discussed in Section 3.2.4 of the RFI.

Many of the submission refer to 'vibroacoustic disease.' The WSP BEIS report (see Section 2.1.1) presents a literature review of effects of noise from wind turbines, which detail the following, in respect of vibroacoustic disease.

Tonin 2018

"Tonin (2018) presented a narrative literature review focussed on wind turbine infrasound, including hypotheses for potential explanations for reported health symptoms and emerging research evidence. The range of hypotheses discussed included 'vibroacoustic disease', a specific 'wind turbine syndrome', and suggestions that exposure to infrasound below perception thresholds may impart stimulation of inner ear components not directly associated with auditory sensations, or vestibular activation, which may be linked with 'motion sickness' symptoms. Tonin noted that, from those reviewed, the only observational study to examine infrasound was the Health Canada study, which employed year-long measurements to demonstrate that wind turbine infrasound could sometimes be detected up to 10 km, but was often below residual levels; infrasound levels measured near the turbine base were around a perception threshold corresponding to the most sensitive 1% of people. Tonin reported the results from the author's own experimental study, which used controlled infrasound exposure based on a real wind turbine signal. It was found that exposure to either real or sham infrasound had no influence on the reporting of health symptoms by participants. However, the expectation of effects connected with the participants' attitudes prior to the experiment did have a significant effect, which supports a nocebo explanation for reported health symptoms associated with wind turbine

infrasound. Tonin also reviewed an earlier experimental study that used lower levels of infrasound exposure (Tonin asserted these levels were too low, such that the experimental comparison for exposure groups would have been sham/sham rather than real/sham), but arrived at similar conclusions; symptom reporting could be explained by nocebo effects rather than infrasound exposure". [14]

Van Kamp et al (2018)

"The authors identified that the symptoms proposed to be connected with exposure to inaudible infrasound are already described in the manual of health disorders as associated with generalised anxiety disorder, and noted that anxiety could be brought about by negative feelings about new or planned wind farms. It was concluded that there is little scientific evidence to support any new or unique health effects associated with wind turbine infrasound or low frequency sound. Reported symptoms linked with wind turbine infrasound could be explained by stress. Suggestions of wind turbine syndrome and vibroacoustic disease are not supported." [15]

3.3 Low Frequency Noise (LFN) and infrasound

The term infrasound can be defined as the frequency range below 20 Hz, while low frequency noise (LFN) is typically in the frequency range 20 – 200 Hz. An average young healthy adult has an audible range from 20 Hz to 20,000 Hz, although the sensitivity of the ear varies with frequency and is most sensitive to sounds with frequencies between 500 Hz and 4,000 Hz. Accordingly, the average human can hear LFN but cannot hear infrasound.

Wind turbines do produce low frequency sounds, but our threshold of hearing at such low frequencies is relatively high i.e. low frequency sounds need to have a high level of amplitude before they are audible. Therefore, LFN will usually go unnoticed.

Infrasound from wind turbines is often at levels below that of the infrasound generated by other local noise sources, for example, from the wind around buildings and other obstacles.

Many of the submissions express concern with regards to the potential for LFN and / or infrasound generated by the proposed wind turbines and the potential for adverse health impacts attributable to exposure to certain levels of LFN. However, levels of LFN and infrasound have been found to be particularly low from wind turbines and this is backed up by a large body of work, some of which is detailed here:

In 2004, the former UK Department for Trade and Industry (DTI) commissioned The Hayes McKenzie Partnership to report on claims that infrasound or LFN emitted by wind turbine generators (WTGs) were causing health effects. Of the 126 wind farms operating in the UK at that time, five had reported LFN problems, therefore, such complaints are an exception, rather than a general problem that exists for all wind farms. Hayes McKenzie investigated the effects of infrasound and LFN at three of the wind farms for which complaints had been received and the results were reported in May 2006 [16]. The report concluded that:

- *'infrasound associated with modern wind turbines is not a source which will result in noise levels which may be injurious to the health of a wind farm neighbour;*
- *low frequency noise was measurable on a few occasions but below the existing permitted [UK] Night Time Noise Criterion. Wind turbine noise may result in internal noise levels within a dwelling that is just above the threshold of audibility, however at all sites it was always lower than that of local road traffic noise;*
- *that the common cause of complaint was not associated with LFN, but the occasional audible modulation of aerodynamic noise especially at night. Data collected showed that the internal noise levels were insufficient to wake up residents at these three sites. However once awoken, this noise can result in difficulties in returning to sleep.'*

The Applied and Environmental Geophysics Research Group at Keele University was commissioned by the UK Ministry of Defence (MOD), the DTI and the British Wind Energy Association (BWEA) to undertake micro-seismic and infrasound monitoring of LFN and vibrations from wind farms for the purposes of siting wind farms in the vicinity of the Eskdalemuir Seismic Array in Scotland. Whilst the testing showed that vibration can be detected several kilometres away from wind turbines, the levels of vibration from wind turbines were so small that only the most sophisticated instrumentation can reveal their presence and they are almost impossible to detect [17]. Nevertheless, the Renewable Energy Foundation alleged potential adverse health effects and when that story was picked up in the popular press, notably the Scotsman, the report's authors expressed concern over the way in which their work had been misinterpreted and issued a rebuttal statement in August 2005, stating:

'Vibrations at this level and in this frequency range will be available from all kinds of sources such as traffic and background noise – they are not confined to wind turbines. To put the level of vibration into context, they are ground vibrations with amplitudes of about one millionth of a millimetre. There is no possibility of humans sensing the vibration and absolutely no risk to human health.'

In response to concerns that wind turbines emit infrasound and cause associated health problems, Dr Geoff Leventhall, Consultant in Noise Vibration and Acoustics and author of the Defra Report on *Low Frequency Noise and its Effects*, said in the article in the Scotsman ('Wind Farm Noise Rules 'Dated'- James Reynolds, 5 August 2005'):

'I can state quite categorically that there is no significant infrasound from current designs of wind turbines.'

An article published in the IOA Bulletin (March/April 2009) concluded that there is no robust evidence that either low frequency noise (including 'infrasound') or ground-borne vibration from wind farms, has an adverse effect on wind farm neighbours.

Further work by Dr Leventhall looked at infrasound levels within the ear, compared to external sources, and concluded:

'The conclusion is that the continuous inner ear infrasound levels due to internal sources, which are in the same frequency range as wind turbine rotational frequencies, are higher than the levels produced in the inner ear by wind turbines, making it unlikely that the wind turbine noise will affect the vestibular systems, contrary to suggestions made following the measurements at Shirley. The masking effect is similar to that in the abdomen (Leventhall 2009). The body, and vestibular systems, appear to be built to avoid disturbance from the high levels of infrasound which are produced internally from the heartbeat and other processes. In fact, the hearing mechanisms and the balance mechanisms, although in close proximity, have developed to minimise interaction (Carey and Amin 2006).'

During a planning Appeal (PPA-310-2028, Clydeport Hunterston Terminal Facility, approximately 2.5 km south-west of Fairlie, 9 Jan 2018), the health impacts related to LFN associated with wind turbines were considered at length by the appointed Reporter (Mr M Croft) [18]. The Reporter considered evidence from Health Protection Scotland and the National Health Service. In addition, he also considered LFN surveys undertaken by the Appellant and the Local Authority, both of which demonstrated compliance with planning conditions and did not identify any problems attributable to the turbine operations; some periods with highest levels of low frequency noise were in fact recorded when the turbines were not operating.

The Reporter concluded that:

- The literature reviews by bodies with very significant responsibilities for the health of local people found insufficient evidence to confirm a causal relationship between wind turbine noise and the type of health complaints cited by some local residents;
- The NHS's assessment is that concerns about health impact are not supported by good quality research; and,

- Although given the opportunity, the Community Council failed to provide evidence that can properly be set against the general tenor of the scientific evidence.

To summarise, it is acknowledged that LFN can be generated from operational wind turbines, however, the levels are below that at which adverse impacts may occur. Levels of infrasound associated with wind turbine operations are particularly low and no higher than is experienced in everyday settings with no wind turbines present. Accordingly, no adverse health effects, including loss of sleep, are anticipated.

3.4 Amplitude Modulation (AM)

In the context of wind turbine noise, amplitude modulation describes a variation in noise level over time; for example, observers may describe a ‘whoosh whoosh’ sound, which can be heard close to a wind turbine as the blades sweep past. Amplitude Modulation (AM) of aerodynamic noise is an inherent characteristic of wind turbine noise and was noted in ETSU-R-97, on page 68:

“The modulation or rhythmic swish emitted by wind turbines has been considered by some to have a characteristic that is irregular enough to attract attention. The level and depth of modulation of the blade noise is, to a degree, turbine-dependent and is dependent upon the position of the observer. Some wind turbines emit a greater level of modulation of the blade noise than others. Therefore, although some wind turbines might be considered to have a character that may attract one's attention, others have noise characteristics which are considerably less intrusive and unlikely to attract one's attention and be subject to any penalty. This modulation of blade noise may result in a variation of the overall A-weighted noise level by as much as 3dBA (peak to trough) when measured close to a wind turbine. As distance from the wind turbine [or] wind farm increases, this depth of modulation would be expected to decrease as atmospheric absorption attenuates the high frequency energy radiated by the blade.”

In recent times the acoustics community has sought to make a distinction between the AM discussed within ETSU-R-97, which is expected at most wind farms and as such may be considered as ‘Normal Amplitude Modulation’ (NAM), compared to the unusual AM that has sometimes been heard at some wind farms, hereinafter referred to as ‘Other Amplitude Modulation’ (OAM). The term OAM is used to describe an unusual feature of aerodynamic noise from wind turbines, where a greater than normal degree of regular fluctuation in sound level occurs at blade passing frequency, typically once per second. In some appeal decisions it may also be referred to as ‘Excess Amplitude Modulation’ (EAM). It should be noted that the noise assessment and rating procedure detailed in ETSU-R-97 fully takes into account the presence of the intrinsic level of NAM when setting acceptable noise limits for wind farms and as indicated by Association of Acoustic Consultants of Ireland (AACI) in *Noise Guidelines for Local Authorities* [19], the noise limits in the Wind Energy Development Guidelines (WEDG 2006), although not explicit, “are evidently derived from ETSU-R-97”.

On 16 December 2013, Renewable UK (RUK) released six technical papers on AM, which reflected the outcomes of research commissioned over the previous three years, together with a template planning condition. Whilst this research undoubtedly improved understanding of Other Amplitude Modulation (OAM) and its effects, it should be noted that at the time of writing it has not been endorsed by any relevant body such as the Institute of Acoustics (IOA).

On 22 January 2014, the IOA released a statement regarding the RUK research and the proposed planning condition to deal with the issue of amplitude modulation from a wind turbine and stated:

“This research is a significant step forward in understanding what causes amplitude modulation from a wind turbine, and how people react to it. The proposed planning condition, though, needs a period of testing and validation before it can be considered to be good practice. The IOA understands that RenewableUK will shortly be making the analysis tool

publicly available on their website so that all interested parties can test the proposed condition, and the IOA will review the results later in the year. Until that time, the IOA cautions the use of the proposed planning condition. [20]

Research regarding amplitude modulation continued. In April 2015, the IOA issued a discussion document entitled '*Methods for Rating Amplitude Modulation in Wind Turbine Noise*' [21]. The document presented three methods that can be used to quantify the level of AM at a given measurement location. After extensive consultation a preferred method of measuring OAM, which provides a framework for practitioners to measure and rate AM, was recommended by the IOA.

On 3 August 2015, the UK's Department for Energy and Climate Change (DECC), commissioned independent consultants WSP Parsons Brinkerhoff to carry out a literature review on OAM (which they refer to simply as AM). The stated aims were as follows:

- *"To review the available evidence on Amplitude Modulation (AM) in relation to wind turbines, including but not limited to the research commissioned and published by RenewableUK in December 2013;*
- *To work closely with the Institute of Acoustics' AM working group, who are expected to recommend a preferred metric and methodology for quantifying and assessing the level of AM in a sample of wind turbine noise data;*
- *To review the robustness of relevant dose response relationships, including the one developed by the University of Salford as part of the RenewableUK study, on which the correction (or penalty) for amplitude modulation proposed as part of its template planning condition is based;*
- *To consider how, in a policy context, the level(s) of AM in a sample of noise data should be interpreted, in particular determining at what point it causes a significant adverse impact;*
- *To recommend how excessive AM might be controlled through the use of an appropriate planning condition; and*
- *To consider the engineering/cost trade-offs of possible mitigation measures."*

Their report, which was released in October 2016 [22], concluded that there is sufficient robust evidence that excessive AM leads to increased annoyance from wind turbine noise and recommended that excessive AM is controlled through a suitably worded planning condition, which will control it during periods of complaint. Those periods should be identified by measurement using the metric proposed by the work undertaken by the IOA, and enforcement action would rely upon professional judgement by Local Authority Environmental Health Officers based on the duration and frequency of occurrence.

It is not clear within the body of the report, which evidence the authors relied upon to arrive at their conclusions, although the Executive Summary states (page 4);

"It is noted that none of the Category 1 or 2 papers have been designed to answer the main aim of the current review in its entirety. The Category 1 studies have limited representativeness due to sample constraints and the artificiality of laboratory environments, whereas the Category 2 studies generally do not directly address the issue of AM WTN exposure-response. A meta - analysis of the identified studies was not possible due to the incompatibility of the various methodologies employed. Notwithstanding the limitations in the evidence, it was agreed with DECC that the factors to be included in a planning condition should be recommended based on the available evidence, and supplemented with professional experience".

The report states that any planning condition must accord with existing planning guidance and should be subject to legal advice on a case by case basis. Existing guidance would include compliance with the six tests of a planning condition, which are embodied in various UK documents depending on the country e.g. Circular 4/98 in Scotland.

In Ireland the same six tests are detailed within Section 28 Development Management Guidelines for Planning Authorities, 2007 [23], and the Office of the Planning Regulator (OPR) Practice Note PN03, 2022 [24]. The six tests are; Necessary; Relevant to planning; Relevant to the development to be permitted; Enforceable; Precise; and Reasonable.

The report's authors did not dictate a particular condition to be used but did suggest that any condition should include the following elements (p5):

- “The AM condition should cover periods of complaints (due to unacceptable AM);
- The IoA-recommended metric should be used to quantify AM (being the most robust available objective metric);
- Analysis should be made using individual 10-minute periods, applying the appropriate decibel ‘penalty’ to each period, with subsequent analysis;
- The AM decibel penalty should be additional to any decibel penalty for tonality; [tonality means mechanical sound already covered by ETSU noise limits]; and
- An additional decibel penalty is proposed during the night time period to account for the current difference between the night and day limits on many sites to ensure the control method works during the most sensitive period of the day.”

At the time of writing there has been no official response to those recommendations from the IOA Noise Working Group and, as yet, no endorsement from any Government.

At present there is no method available to predict AM and, as a result it is not possible to predict what impact the inclusion of an AM condition would have on the operation of the wind farm.

The recommendation to impose a planning condition and the associated penalty scheme is at odds with the advice from the IOA GPG, which currently states (paragraph 7.2.10):

“The evidence in relation to “Excess” or “Other” Amplitude Modulation (AM) is still developing. At the time of writing, current practice is not to assign a planning condition to deal with AM.”

It is noted that OAM, should it occur on a site, can be controlled through statutory nuisance powers and in the absence of robust research this is considered to be the most appropriate way to control OAM where required. In this respect it is worth noting a recent Appeal decision in Scotland. For Clachaig Glen Wind Farm (WIN-130-7), in the report produced for Scottish Ministers, the Reporter, J Alasdair Edwards, stated;

“... I also follow the applicants witness evidence that residents would continue to be protected against excessive amplitude modulation as it would be covered under statutory nuisance powers” [25].

The Decision Notice for that development (DOC17) stated;

“In relation to concerns about amplitude modulation, which were also discussed at the public inquiry, it is noted by the Scottish Ministers that the Reporter concluded that if there is excessive amplitude modulation it would be covered under statutory nuisance powers concluding that there was no necessity for a condition to be applied” [26].

3.5 Potential impacts on animals (livestock)

Several submissions have expressed concern in respect of operational noise effects on cattle, including health effects and reduced milk production.

A number of studies have been published considering noise levels in general and their effects on cattle, one of which, *Importance of Noise Hygiene in Dairy Cattle Farming—A Review* [27], is referred to several of the submissions.

Effects of Noise on Wildlife and Other Animals (1971) [28], written for the US Environmental Protection Agency includes a section looking at the Effects of Noise on Farm Animals, including pigs, cattle and poultry, but found that noise effects had little impact on milk production.

A number of studies have been carried out on the effects of noise on cattle from low-flying aircraft, including jets, helicopters and sonic booms and in response to concerns about noise effects on both milk production and pregnancies in cattle, the U.S. Air Force prepared a handbook for environmental protection summarising these studies. No link was identified between either reduced milk production or disturbance to pregnancies and in a report to congress in 1992 the U.S. Forest Service stated; *“there is no proven cause-and-effect link between startling cattle from aircraft overflights and abortion rates or lower milk production.”* [29]

Whilst noise from low-altitude flights is not directly comparable to continual noise produced by wind turbines, it should be noted that impact or impulsive noise i.e. noise levels that increase and decrease rapidly such as may occur from a low-altitude flypast, is much more likely to cause disturbance to animals than the continual and consistent noise generated by wind turbines. In this regard Head et al states, *“Many studies indicate that sudden, novel sounds seem to affect cattle behaviour more than continuous high noise”* (1993) [30].

With regards to the ability of cattle to discern LFN it is worth noting the paper *‘Effect Of Noise On Performance, Stress, and Behaviour of Animals’* (J Brouček) [31], which states; *“Cattle hear high-frequency sounds much better than humans, their high-frequency hearing limit being 37 kHz, compared with only 18 kHz for humans (Heffner, 1998). Their best audible sound is also at a higher frequency, at about 8 kHz, compared with 4 kHz for humans (Phillips, 2009). However, thresholds for discomfort for cattle was noted at 90-100 dB, with physical damage to the ear occurring at 110 dB. (Phillips, 2009). Indeed, cattle, with an auditory range between 25 Hz and 35 kHz, can detect lower pitched sounds than other farm species (Heffner and Heffner 1993). Dairy breeds are more sensitive to noise than beef breeds (Lanier et al., 2000)”*. Therefore, cattle have a similar low frequency threshold to humans (25Hz compared to 20 Hz), but their higher frequency response extends beyond the human range and they are more sensitive to noise at higher frequencies than humans. Accordingly, it is reasonable to assume that cattle will be no more affected by LFN than a human would.

The 2023 paper *Importance of Noise Hygiene in Dairy Cattle Farming—A Review*, is referred to in several of the submissions, however, the findings of this paper are misrepresented and / or misunderstood. Whilst the paper does discuss the potential for adverse noise impacts on cattle, the sound levels quoted, which are predominantly based on measurements inside farm buildings, are many times higher than the noise levels that cattle would be exposed to from the operation of a wind turbine. The paper is primarily concerned with noise from farmyard plant, such as milking machines, mechanical ventilation etc, and routinely refers to measured noise levels in farms in the range of 60 – 80 dB. In fact, the only recommendation in the paper in respect of what would be an appropriate noise level is; *“When milking dairy cows, the noise level should not exceed 65–70 dB, or if it exceeds this value, it should be for a short time”*. Operational noise levels from the Proposed Development would be much lower than this.

The findings in the paper that have been reported in the submissions have been taken out of context and have little relevance to the Proposed Development.

3.6 Cumulative noise

Many submissions describe the number of wind turbine proposals within the local area and as such are concerned regarding the potential for cumulative noise impacts. As an example, the Clonberne Health and Special Needs Committee Submission states;

“in Appendix 12-2 MKO state that ‘due to the considerable distances between these turbines and the proposed project, there is no realistic prospect of cumulative wind turbine noise effects at the receptors considered in this assessment. As

such, cumulative noise has not been considered further in the report'. This is such disregard on MKO's part considering that if planning is approved for the Clonberne windfarm and the Cooloo windfarm there will be 24 turbines within a 15 km area. We are sure that annoyance and nuisance from these turbines will be heightened within the communities due to the cumulative effect."

In response we note the following;

The cumulative impact of wind turbine noise is built into the assessment methodology, as presented in detail in the IOA GPG. The method to be followed requires the following steps to be taken;

- Undertake baseline noise level monitoring and use the measured noise levels⁶ to determine the Total Noise Limits for a given receptor. These are the levels (limits) that should not be exceeded from the cumulative operation of all turbine developments in the area.
- Predict the operational noise levels of all wind turbines in the area (the Total Noise Level) and compare the predicted levels to the Total Noise Limits.
- Calculate a set of Site-Specific Noise Limits to ensure that the contribution from the individual proposed development does not contribute to an exceedance of the Total Noise Limits by the Total Noise Level.

This is the procedure that is followed by TNEI for all wind turbine developments, however, in this case there are no other turbines in the area, including those proposed as part of the Cooloo Wind Farm, that are close enough to contribute anything to the Total Noise Level. To put this into context, we can look at the way in which noise levels add together, which is a logarithmic sum, as opposed to an arithmetic sum.

When two noise sources of the same noise level are added together the overall sound pressure level increases by 3 dB, for example;

$$40 \text{ dB} + 40 \text{ dB} = 43 \text{ dB}$$

If two noise sources are more than 12 dB apart, then there is no increase in the sound pressure level, for example;

$$30 \text{ dB} + 42 \text{ dB} = 42 \text{ dB}$$

TNEI considered all of the existing and proposed wind turbines within the area and this is detailed in Section 5.1 of Technical Appendix 12-2. The closest identified turbines were at a distance of approximately 6 km. At that distance the noise level from those turbines would be much more than 10 dB lower than the noise levels from the Proposed Development. Therefore, there can be no increase in the overall noise level.

3.7 Use of candidate turbine and mitigation measures

A candidate turbine is used in the noise assessment, as final specifications of the turbine are not yet known. This is typical for wind farm planning applications, as selecting a final turbine specification at the planning stage provides no commercial flexibility and binds the applicant to a turbine that may no longer be available by the time the wind farm is under construction. Many submissions, however, express suspicion or concern about the use of a candidate turbine, perhaps believing that this could be a method to present quieter noise levels than would occur for the final, installed turbine specification. Similarly, some submissions question the effectiveness of mitigation measures, in respect of both noise level and OAM, if a final turbine cannot be committed to at this stage.

⁶ Note. The baseline noise levels used to establish the Total Noise Limits does not contain any data with wind turbine noise present.

We would note that it is very rare for the exact specification of a wind turbine to be known at the planning application stage of a wind turbine development. If a development is consented on a specific turbine model then the Developer is at a significant commercial disadvantage i.e. no competitive tendering process can be undertaken as they are bound to using only one particular manufacturer (and model). In addition, planning submissions can be made years before planning consent is granted, and planning consent is typically granted many months or even years prior to actual erection of the turbines, by which time a particular turbine model may no longer be available or better alternatives (more efficient, quieter, easier to obtain etc.) may be on the market. This is true of other development types, not just wind turbine developments. Battery Energy Storage Systems (BESS) are another prime example of this. Accordingly, it is important for any planning application to consider how impacts may vary for a given range of turbine specifications and for noise assessments a candidate turbine type will be selected that is representative of the class and type of turbine within a defined turbine envelope.

It should be noted that the assessment constitutes two separate elements; 1) the setting of appropriate noise limits and 2) undertaking noise level predictions to demonstrate that the development will be able to meet those limits. Ultimately, however, the Developer is bound by the limits and whichever turbine is finally chosen, the limits will remain and must be met.

Related to the use of a candidate turbine, concerns have also been raised regarding the fact that an assessment of OAM has not been undertaken, therefore, any mitigation for OAM would be *“Reactive, rather than proactive mitigation”*.

In respect of OAM, whether or not a particular turbine type has been specified is irrelevant, as it is not possible to predict the likelihood of OAM occurring. This is explained in Section 3.4 but to summarise the three key points relevant to this topic;

- It is not possible to predict the likelihood of OAM occurring from any wind turbine type or for any given location.
- It is possible to determine if OAM is occurring and to quantify any levels of OAM through measurement;
- There is no accepted level of penalty that can be applied to predicted or measured wind turbine noise to account for OAM as there is insufficient dose-response relationship evidence available. For example, is a small amount of OAM more acceptable than a higher absolute noise level, are higher levels of OAM for a short duration more or less acceptable than lower levels of OAM for longer durations, and so on?

We acknowledge that there is sufficient robust evidence that excessive AM leads to increased annoyance from wind turbine noise, however, it should be noted that whilst OAM may occasionally be present, it is not a regular occurrence on wind farm sites, it can be measured and monitored, and it can be controlled. This is discussed in the Renewable UK document *‘Summary of Research into Amplitude Modulation of Aerodynamic Noise from Wind Turbines’* [32], which states;

“At present there is no way of predicting OAM at any particular location before turbines begin operation due to the general features of a site or the known attributes of a particular turbine. However, it appears that the conditions leading to OAM and the characteristics of OAM when it occurs are very site specific. Additionally, it is clear that OAM only occurs infrequently, at a minority of sites.”

The study has found that by minimising the onset of blade stall, the occurrence of OAM is also likely to be minimised. The study highlights that if OAM arises from a scheme, data from the SCADA system can be used to programme turbine management systems to control specific turbines (normally only one or two turbines are the cause of any particular problem under specific environmental conditions) so that the impacts are mitigated under the precise conditions that give rise to the phenomenon in those particular circumstances. The study acknowledges that this would potentially reduce the electricity production in these particular environmental conditions. However, as OAM may occur*

only infrequently and intermittently at any particular site, any reduction in overall output should be correspondingly small.”

* “SCADA - Supervisory Control and Data Acquisition system – generally installed on wind farms to control and monitor the operation of turbines.” 2.1.2

Other issues raised, that are related to the assessment and use of mitigation measures, include the following;

“Overlooked Cumulative Effects: The mitigation schedule mentions that different turbine models may or may not require low noise modes but does not consider the cumulative impact of noise from multiple turbines operating simultaneously. This is a significant oversight, as the combined noise from all turbines could exacerbate the noise levels experienced by nearby residents, especially during specific wind conditions that amplify the sound”

This is incorrect. All of the noise modelling that has been undertaken, including the calculation of required Mode Management for noise mitigation purposes, considers the cumulative impact from all turbines operating. The noise modelling also includes the complete range of wind speeds, from turbine cut in speed to maximum noise level output, and also considers variation in wind direction.

In respect of all turbines operating alongside other consented wind turbine developments, this has already been covered in Section 3.6.

“Lack of Comprehensive noise Assessment: The strategy does not appear to consider how noise from the wind farm will interact with other environmental noise sources (e.g. traffic, farm-related work) or how it will propagate through the local topography. This could lead to an underestimation of the noise impact, particularly in areas where sound may carry further due to wind patterns or terrain.”

This is incorrect. The modelling and assessment methodology considers both the existing soundscape, differing wind conditions and topographical features, all in accordance with the WEDG 2006, ETSU-R-97 and the IOA GPG.

3.8 Construction noise

Several submissions present concerns in respect of construction levels that are likely to be experienced. The construction noise assessment, which is inherently conservative, has indicated that noise levels from construction activities will remain below the thresholds for potentially significant effects, as defined in BS 5228-1:2009+A1:2014.

One submission raises concerns in respect of noise that may be experienced within the proposed borrow pit/quarry area, in respect of disturbance to fauna. This is discussed in Section 3.2.17 of the RFI.

3.9 Blasting

The estimated volume of crushed stone to be extracted from the borrow pit and for the construction of the Proposed Project is 106,770m³. Hardcore materials will be extracted from the borrow pit (and other infrastructure locations, if necessary), principally by means of rock breaking, which is the preferred method of rock extraction. Blasting would only be undertaken if where rock breaking is not suitable, and would only be carried out after notifying local residents. The developer is committed to notifying all properties within 1km of any proposed blast location which, is greater than the distance stated in the quarry guidance of 500 m, *Quarries and Ancillary Activities Guidelines for Planning Authorities April 2004 (DoEHG)* [33]. Any blasting would be carried out in accordance with the Guidance on the Safe Use of Explosives in Quarries (Safety and Health Commission for the Mining and Other Extractive Industries, 2002) [34], as well as British Standard BS 5228-1:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites – Part 1 Noise and Part 2 Vibration.

References

References

- [1] Energy Technology Support Unit (ETSU), *The Assessment and Rating of Noise from Wind Farms*, ETSU, 1996.
- [2] Institute of Acoustics (IOA), *A Good Practice Guide to the Application of ETSU-R-97 for the Assessment and Rating of Wind Turbine Noise*, IOA, 2013.
- [3] International Standards Organisation (ISO), *ISO 9613-2:2024 Acoustics - Attenuation of sound during propagation outdoors*, ISO, 2024.
- [4] Department of Housing, Local Government and Heritage, *Wind Energy Development Guidelines* (2006), Government of Ireland, 2006.
- [5] British Standards (BS), *BS 5228-1 Code of practice for noise and vibration control on construction and open sites - Noise*, BS, 2009.
- [6] Department of Housing, Planning and Local Government, *Draft Revised Wind Energy Development Guidelines*, Government of Ireland, 2019.
- [7] Ireland, High Court (IEHC), Webster/Rollo v Meenaclogher (Wind) Limited, IEHC, 2014.
- [8] British Standard (BS), *BS 4142:2014+A1:2019 Methods for rating and assessing industrial and commercial sound*, BS, 2019.
- [9] WSP, *A Review of Noise Guidance for Onshore Wind Turbines*, Department for Business, Energy & Industrial Strategy, 2023.
- [10] Scottish Government, *Onshore wind turbines: planning advice*, Scottish Government, 2014.
- [11] Scottish Government, *Onshore wind: policy statement 2022*, Scottish Government, 2022.
- [12] An Bord Pleanála, *Inspector's Report ABP-308885-20*, An Bord Pleanála, 2023.
- [13] World Health Organisation (WHO), *Environmental noise guidelines for the European Region*, WHO, 2018.
- [14] R. Tonin, *A Review of Wind Turbine-Generated Infrasound: Source, Measurement and Effect on Health*, Acoustics Australia, 2018.
- [15] V. K. e. al, *Health Effects Related to Wind Turbine Sound, Including Low-Frequency Sound and Infrasound*, Acoustics Australia, 2018.
- [16] Hayes McKenzie Partnership Ltd, *Low Frequency and Infrasound Noise Immission from Wind Farms and the potential for Vibro-Acoustic disease*, Machynlleth & Salisbury, 2006.
- [17] S. e. al, *Microseismic and Infrasound Monitoring of Low Frequency Noise and Vibrations from Windfarms*, Keele University, 2005.
- [18] M. Croft, *Appeal Decision Notice*, Planning and Environmental Appeals Division, Scottish Government, 2018.

- [19] Association of Acoustic Consultants of Ireland (AACI), *Environmental Noise Guidance for Local Authority Planning & Enforcement Departments*, AACI, 2021.
- [20] Institute of Acoustics (IOA), “*Cautious welcome for wind turbine noise proposal*,” 2014. [Online]. Available: <https://www.ioa.org.uk/news/cautious-welcome-wind-turbine-noise-proposal>. [Accessed 04 12 2025].
- [21] Institut of Acoustics (IOA), *Methods for Rating Amplitude Modulation in Wind Turbine Noise*, IOA, 2015.
- [22] WSP, *Wind Turbine AM Review*, Department of Energy & Climate Change, 2016.
- [23] Department of the Environment, Heritage and Local Government, *Development Management Guidelines for Planning Authorities*, Government of Ireland, 2007.
- [24] Office of the Planning Regulator (OPR), *OPR Practice Note PN03 Planning Conditions*, OPR Ireland, 2023.
- [25] K. B. & D. Jackman, *Report to the Scottish Ministers*, Planning and Environmental Appeals Division, 2019.
- [26] E. Ramsay, *Decision Notice*, Directorate for Local Government and Communities Planning and Architecture Division: Planning Decisions, 2019.
- [27] D. e. al, *Importance of Noise Hygiene in Dairy Cattle Farming - A Review*, Acoustics, 2023.
- [28] Memphis State University, *Effects of Noise on Wildlife and Other Animals*, US Environmental Protection Agency, 1971.
- [29] US Forest Service (USFS), *Potential Impacts of Aircraft Overflights of National Forest System Wildernesses*, USFS, 1992.
- [30] H. e. al, *Milk Yield, Milk Composition, and Behavior of Holstein Cows in Response to Jet Aircraft Noise Before Milking*, University of Florida, 1993.
- [31] J. Broucek, *Effects of noise on performance, stress, and behaviour of animals: A review*, National Agricultural and Food Centre, 2014.
- [32] Renewable UK (RUK), *Summary of Research into Amplitude Modulation of Aerodynamic Noise from Wind Turbines*, RUK, 2013.
- [33] Office of the Planning Regulator (OPR), *Quarries and Ancillary Activities Guidelines for Planning Authorities*, OPR Ireland, 2004.
- [34] Safety and Health Commission for the Mining and other Extractive Industries, *Guidance on the Safe Use of Explosives in Quarries*, Health and Safety Authority, 2002.

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