

Department for Business, Energy and Industrial Strategy review of onshore wind turbine noise assessment guidance: Stakeholder Engagement Survey

Introduction

The UK Government Department for Business, Energy and Industrial Strategy is undertaking a **scoping review** of current UK onshore wind turbine noise assessment guidance. The purpose of the review is to determine whether the guidance adequately ensures that wind turbine noise is managed effectively and consistently in line with current Government policies on noise and achieving 'Net Zero'¹ greenhouse gas emissions by 2050, accounts for contemporary technological and acoustical developments, and (if not), what updates may be necessary to achieve this.

This survey is divided into three main parts: 1) questions about topics addressed in the current UK wind turbine noise guidance, 2) questions about wind turbine technology and wind farm design, and 3) a request for any other evidence or suggestions that may be relevant to the intentions of this scoping review.

At this **scoping stage**, no guidance development is being undertaken; the current review will inform a decision on whether any future guidance development is required, but any potential subsequent development of guidance is likely to be accompanied by a consultation stage. Accordingly, responses to this survey do not need to include highly detailed information such as might be entered in response to engagement on specific proposals for guidance development. However, please ensure you raise any **key issues** that you feel should be considered at this stage. Please also note that the scope of the review encompasses **onshore** wind turbines only.

This review and engagement does not affect any material considerations of the current UK onshore wind turbine noise assessment guidance within ongoing planning applications and decisions, which remain as referenced in the relevant authority policies.

You will be given the opportunity at the end of the survey to indicate whether you would like to discuss your responses in more detail by telephone interview. No guarantee can be given at this stage that a telephone interview will be possible - this will depend on the numbers of respondents indicating a preference for telephone contact.

Your responses to this engagement will be an important part of ensuring that the wind turbine noise assessment guidance in the UK is consistent with Government policies, and remains suitable.

¹ Achieving the Government's ambitious 2050 Net Zero target will require significant increases in renewable electricity generation, and we will need to increase deployment across a range of technologies, including onshore wind. Our recent Energy White Paper: *Powering our net zero future* stated that we will need sustained growth in the capacity of onshore wind over the next decade, alongside solar PV and offshore wind.

Definitions

PLEASE READ THIS PAGE CAREFULLY BEFORE CONTINUING WITH THE SURVEY

Term

Current UK wind turbine noise assessment guidance

Meaning

ETSU-R-97 The Assessment and Rating of Noise from Wind Farms (1996), the Institute of Acoustics Good Practice Guide to the Application of ETSU-R-97 (2013) and its six Supplementary Guidance Notes (2014)

It is acknowledged that further individual devolved UK administration noise guidance is also in place, both wind turbine specific and non-specific.

It is also acknowledged that the SGNs to the IOA GPG do not officially form part of the guidance endorsed by all devolved administrations, due to the publication dates (specifically, the Northern Ireland Assembly and Scottish Government endorsements preceded the SGN publications). However, it is believed that the IOA GPG SGNs are widely viewed as representing best practice guidance around the UK.

Government policies on noise and Net Zero

The UK devolved administration governmental policies on noise and achieving net zero targets for greenhouse gas emissions relevant in any UK nation to which your professional experience is applicable

If your experience encompasses more than one UK nation, please provide details of any divergence in your responses as they concern the context of the policies of each devolved administration, as appropriate.

Amplitude modulation

A sound characteristic associated with the regular rotation of the wind turbine blades, sometimes described as 'swishing', 'whooshing', 'whoomphing', or 'thumping'

Tonality

A sound characteristic sometimes described as 'droning', 'humming', 'ringing', or 'whistling'

Respondent details

Comments:

This response is on behalf of the INWG, Independent Noise Working Group: www.inwg.co.uk

INWG considers at the outset that it is important for this Scoping review to include organisations which represent directly affected residents, especially those who are most adversely affected by inappropriate onshore wind developments potentially sited too close to their homes.

Familiarity with the current UK wind farm noise assessment guidance

Q1.1: Which description most closely describes your level of familiarity with the current UK wind turbine noise assessment guidance? (Choose one answer)

- ☐ A) Very familiar / expert understanding / very frequent use in practice
- X B) Familiar / good working knowledge / regular use in practice
- ☐ C) Passing familiarity / some understanding / occasional use in practice
- ☐ D) Unfamiliar / no understanding

If you answered A, B or C to Question 1.1, **please proceed to Question 1.2**

If you answered D to Question 1.1, please could you:

i) provide contact information for an individual at your organisation who is able to answer A, B or C to question Q1.1 (ie, has some familiarity with the current UK wind turbine noise assessment guidance);

ii) **proceed to Question 2.1**

Adequacy of current UK wind farm noise assessment guidance

Q1.2: Which description most closely matches your view on the adequacy of the current UK wind turbine noise guidance in ensuring wind turbine noise is managed effectively and consistently in line with Government policies on noise and Net Zero? (Choose one answer)

- ☐ A) Adequate, no updates necessary
- ☐ B) Mostly adequate, but requires some updating or amendment
- X C) Inadequate and requires substantial revision
- ☐ D) Not sure

If you answered A to Question 1.2, **please proceed to Question 2.1**

If you answered B, C or D to Question 1.2, **please proceed to Question 1.3**

Topics requiring updating

Q1.3: Which (if any) of the following topics relevant to the current UK wind turbine noise assessment guidance do you consider need to be updated? (Choose as many as applicable)

- ☒ Fundamental approach (holistic view of the guidance on managing wind turbine noise)
- ☒ Baseline determination (pre-development environment)
- ☒ Measurements of sound or meteorology
- ☒ Consideration of atmospheric, meteorological, or topographical influences on sound
- ☒ Evaluation of sound characteristics
- ☒ Sound predictions
- ☒ Noise impact assessment (including cumulative impact)
- ☒ Noise controls (including noise limits, effects thresholds, and use of planning conditions)
- ☒ Compliance determination and enforcement
- ☒ Uncertainty
- ☒ Anything else not listed above (please specify in comments)

Comments:

We are told this review “will inform a decision on whether any future guidance development is required”. INWG finds the same issues occurring across a number of wind turbine sites, in other words, there is a pattern of failure, the failures are not isolated incidents; they are systemic.

INWG finds the current wind farm noise guidance needs root and branch reassessment, and as such concludes that future guidance development is required and recommends that consideration is given to other methodologies to replace ETSU-R-97. Matters informing INWG's position are provided in this response.

Description of required updates

Q1.4: Please could you briefly outline the updates you believe need to be made to the current UK wind turbine noise assessment guidance, and identify any publicly accessible evidence you are aware of that would support or inform the updates indicated? (Please enter your responses under the headings

indicated below that are most closely applicable to your suggestion, and use as much space as needed to address the key issues)

(Q1.4) Fundamental approach (holistic view of the guidance on managing wind turbine noise)

(Section i)

Material in this section also falls into other sections therefore please see the other sections referenced for more information.

- A) Wind turbine noise has caused occupants to leave their home and still in 25 years, ETSU-R-97 has not been reviewed See vi) a) Sound Predictions
- B) Use of the L90 metric is out of sync with that used in noise assessments in the UK and worldwide See iii) a) Measurements of sound or meteorology
- C) Evidence on the suitability of ETSU-R-97 to protect public health and well being is absent. See viii) a) Noise controls
- D) Where there is scientific uncertainty, the Noise Policy for England says the precautionary principle applies i.e. the polluter (not the public) pays. See viii) b) Noise controls
- E) The use of the statutory nuisance regime to address excess amplitude modulation is not working See viii) c) Noise controls
- F) The principle that bringing a wind turbine site into operation within its noise limits relies on complaints from the public is untenable; it gives the wind turbine operators' license to operate outside the permitted noise levels. See ix) a) Compliance determination
- G) The noise monitoring surveys do not identify all / the full extent of the exceedances of the noise limits. See ix) b) Compliance determination
- H) It is taking years to identify and address any breaches of the noise limits if they are identified or addressed at all; as such the public are being exposed indefinitely to unacceptable noise levels. See ix) c) Compliance determination

(Q1.4) Baseline determination (pre-development environment)

(Section ii)

a) Background Noise Measurements

Rural, night time background noise measurements have persistently shown unexplained increases as further noise assessments are produced to show noise limits are not exceeded, for example, in the case of Batsworthy, night time background noise levels inexplicably increased by as much as 9dB. While

such patterns were to the detriment of residents, they may be coincidence, however any perception of deception can be avoided by using the lowest background noise levels ever measured for a particular area as should be the case.

(Q1.4) Measurements of sound or meteorology

(Section iii)

a) Use of the L90 metric is out of sync with that used in noise assessments in the UK and worldwide

ETSU-R-97 has received justified criticism over the years following its publication that led to DEFRA seeking the assistance from Institute of Acoustics members to prepare implementation guidelines. The guideline brief was not concerned with seeking any alternative wind farm noise assessment approach and was limited only to guidance on the ETSU-R-97 methodology. The base time unit in ETSU-R-97 is 10-minutes using the L90 statistics, unlike other noise assessment methodologies worldwide that prefer the Leq metric. Industrial noise in the UK also uses the Leq metric (e.g. BS4142).

Since permitting of the Denbrook Wind Farm, that highlighted the possible adverse effect of amplitude modulation (AM), it has become evident that the L90 statistic fails to address this type of sound characteristic and other short duration sound events that are often described as brake squeal or 'whump' and 'thump'. Indeed, the use of LA90,10min seriously underestimates, and hides, the character and true temporal SPL, sound pressure level variations at a dwelling that give rise to nuisance complaints.

A feature of the Leq metric is that higher short duration sound level emissions from wind farms can be identified when the L90 metric simply cannot represent such sounds. High sound levels occurring for less than 9 minutes out of each 10-minute sound level sample are ignored with the L90 metric. As the Leq is an energy average the full 10-minute measurement period is represented. Shorter duration Leq levels over perhaps 1-minute intervals may also be considered in any revised wind farm noise evaluation process.

Another feature of the Leq metric is that it can be corrected to account for ambient sound levels in a mathematically rigorous way that cannot be said for the L90 statistic.

Many jurisdictions around the world use the Leq metric to assess wind farm noise. The use of L90 within ETSU-R-97 is unique and is not consistent with the rest of the world, except for New Zealand and two (out of five) States in Australia that have copied the ETSU-R-97 approach shortly after it was published.

b) Anemometers

The use of anemometers aloft the turbines to determine 10m height wind speeds and directions, creates further scope for uncertainty in noise assessments already riddled with uncertainty. To avoid

unnecessary obfuscation, wind speeds and directions should be taken from 10m high anemometers mounted on an onsite permanent mast.

(Q1.4) Consideration of atmospheric, meteorological, or topographical influences on sound

(Section iv)

ETSU and its later adjustment the IoA GPG (Good Practice Guide) uses hub height wind speeds to calculate the 10m wind speed at receptor sites. There can be significant discrepancies between actual measured 10m height wind speeds and GPG calculations of 10m high wind speeds.

Huntingdonshire District Council published details which showed the GPG result as simply a mirror image of the hub height wind speed data but just a few dB lower. whereas actual 10m measurements showed a much lower dB reading and further research locally for longer periods, identified variations of over 5dB between actual measured wind speed at 10m height and the GPG 10m height wind speeds derived from hub height readings. The GPG calculations favoured the wind farm operator. The development of larger bladed and taller turbines likely compounds the measured and derived 10m height wind speed discrepancies.

As previously stated, wind speeds should be measured at 10m height.

(Q1.4) Evaluation of sound characteristics (including amplitude modulation and tonality)

(Section v)

a) Excess Amplitude Modulation

A straightforward planning condition to address excess amplitude modulation was attached to the development consent for the Den Brook Valley wind farm and was ratified in the Court of Appeal (Hulme v Secretary of State for Communities and Local Government G [2011] EWCA Civ 638)

It is unacceptable that developers have vigorously resisted its further deployment at other sites while failing to provide the public with alternative protection. It is hard to see how support can be justified for planning applications for large-scale wind turbines close to residents while there is ongoing research and as suggested during cross examination at the Clauchrie WPS inquiry, leading wind turbine noise consultants HMP are not quite sure what AM is, or how it's going to be measured, or how it's going to be conditioned. The suggestion from HMP at the Clauchrie Inquiry that with the current state of knowledge, "the best way of dealing with it is to talk with the EHO" is not viable as shown by the ongoing complaints at Cotton Farm where residents have been suffering disturbance and stress for years.

The judgment of the Court of Appeal in the Den Brook case needs to be fully considered and applied in any future applications for onshore wind farms. Amplitude Modulation, whether or not excessive, is a major factor of wind farm noise and previous assertions that it is rare are just not tenable.

(Q1.4) Sound predictions (including modelling and mapping)

Section vi)

a) Wind turbine noise has caused occupants to leave their home and still in 25 years, ETSU-R-97 has not been reviewed

Pre-construction, wind turbine noise levels are predicted using ETSU-R-97, which is government guidance (as opposed to law) and is the only industry where this method is used. In all other industries, noise is assessed under the relevant British Standard, usually BS4142. ETSU-R-97 was published in 1997 since when turbines have increased significantly in size and power with implications for noise. (from blade tip height of 60m to current applications of up to 260m. From generating capacity at 600kW to 5.6MW) The stated aim was not to impose too great a burden on wind farm operators, but the question is whether this has been at the expense of local residents who host wind farms. In particular, nighttime noise issues have been prevalent which brings into sharp focus ETSU-R-97's concept that it is acceptable that the turbines are allowed to make more noise at night than during the day, in other words the noise limits at night are higher than those during the day. This problem is further compounded by 'night amplification', <https://www.masterresource.org/wind-turbine-noise-issues/wind-noise-worse-night/>. On occasions, wind turbine noise has led to house occupiers leaving their home, not something that people tend to do "on a whim" because they don't like wind turbines. Those that do leave their home likely represent the very tip of the iceberg, most suffering in silence.

This also puts focus on the Introduction in ETSU-R-97 which concludes, "The report was drafted in the light of the best information available at the time. However it is acknowledged that as more experience and information become available and as circumstances develop it may become necessary to revise and improve the contents of this report. The Noise Working Group therefore suggests this report and its recommendations are reviewed in two years time. To this end, any comments on the usefulness of the report would be most welcome, including any suggestions for improvement with any supporting evidence where possible."

More than 25 years later and this review has not taken place. It is acknowledged that a "Good Practice Guide" has since been published but this has only modified ETSU-R-97 and the fundamental problems remain. INWG firmly believes that ETSU-R-97 does not adequately protect the interests of residents living close to proposed wind farms, either at the pre-development stage or when addressing complaints, and urges that BS4142 is used instead.

b) Wind turbine sites are commencing operation with exceedances of their noise limits.

By their very nature, predictions do not necessarily represent reality and therefore, at the very least need treating with considerable caution. The operators' noise measurements at the Fullabrook, Batsworthy, Denbrook and Cotton Farm wind farms, showed that they all commenced operation with noise levels greater than those permitted by their noise limits. It is then taking years to bring these sites into operation within their noise limits. Such unreasonable burdens on the public are entirely avoidable. It is irresponsible that this is being allowed to happen; the sites should be comfortably within their noise limits at the point they start operating.

(Q1.4) Noise impact assessment (including cumulative impact)

(Section vii)

a) Cumulative impact assessment

The Executive Summary to ETSU-R-97 states, "The Noise Working Group is of the opinion that absolute

noise limits and margins above background should relate to the cumulative effect of all wind turbines in the area contributing to the noise received at the properties in question. It is clearly unreasonable to suggest that, because a wind farm has been constructed in the vicinity in the past which resulted in increased noise levels at some properties, the residents of those properties are now able to tolerate higher noise levels still. The existing wind farm should not be considered as part of the prevailing background noise." However on its own this consideration is inadequate; it would be unreasonable not to also consider that in some wind directions, there can be some respite from the intensity of the noise impact of the turbines and that if a property is to be exposed to wind turbines in more than one direction, any respite from the greatest intensity of sound is lessened.

In *Tegny Cymru CYF v Welsh Ministers* 2010] EWCA Civ 1635 the potential impact of cumulative noise from a number of wind farms was addressed by the Inspector who dismissed the appeal. While this decision was quashed in the High Court, it was upheld in the Court of Appeal with Elias LJ commenting, at paragraph 35, "To put it colloquially, it seems to me that he thought "enough is enough" as far as these residents were concerned."

b) Measurement uncertainty

When used in planning ETSU-R-97/GPG relies heavily on the production of noise impact assessment diagrams (NIA) at each designated receptor and time periods. Each NIA uses three quantities each averaged over ten minutes: an indexing measured mean wind speed, the measured background, and the ISO-9613 method predicted turbine noise. In processing, and in the use of the NIA in developing planning conditions on any subsequent development, all three quantities are treated as being exact, subject to no uncertainty. It is easy to show that this is not the case: all are subject to measurement error, random variation and even, in the case of the background noise, method induced uncertainty over the choice of statistical function fitted to the data. As a simple example, the ISO 9613 method uses several arbitrary inputs that define a simple distance decay that is stated to have a +/-3dB uncertainty.

Yet, following ETSU, planning decisions and conditions have been set that allow 'headroom' differences of as little as 1dB in situations where prudence and the precautionary principle might argue otherwise. 'Where ETSU is Silent' (Unwin, Sherman & Cox) determines that the uncertainty could be as much as +/-10dB.

c) ISO9613-2 is being used outside its intended application

ISO9613-2 is an engineering, empirical noise model that assumes a stationary sound source in light wind conditions and therefore its application to wind turbines is outside its intended use. Its application to wind turbines is also well outside its intended use in terms of sound source height and distance from the source.

The reality is very different from the ISO9613-2 model. Sound propagation from a wind turbine is very complex, for example it requires 3D modelling using proper physics and that's before considering the highly complex sound field created by multiple turbines interacting together. It is unclear how the use of ISO9613-2 when considering wind turbine noise, ever came about.

(Q1.4) Noise controls (including noise limits, effects thresholds, and use of planning conditions)

(Section viii)

a) Evidence on the suitability of ETSU-R-97 to protect public health and wellbeing is absent.

As the WHO, World Health Organisation states in its 2018 Environmental Noise Guidelines,

"Further research into the health impacts from wind turbine noise is needed so that better-quality evidence can inform any future public health recommendations properly."

"Wind turbines can generate infrasound or lower frequencies of sound than traffic sources. However, few studies relating exposure to such noise from wind turbines to health effects are available."

"The noise emitted from wind turbines has other characteristics, including the repetitive nature of the sound of the rotating blades and atmospheric influence leading to a variability of amplitude modulation, which can be a source of above average annoyance (Schäffer et al., 2016). This differentiates it from noise from other sources and has not always been properly Characterized."

"Assessment of population exposure to noise from a particular source is essential for setting health based guideline values. Wind turbine noise is characterized by a variety of potential moderators, which can be challenging to assess and have not necessarily been addressed in detail in health studies. As a result, there are serious issues with noise exposure assessment related to wind turbines."

<http://www.euro.who.int/en/health-topics/environment-and-health/noise/publications/2018/environmental-noise-guidelines-for-the-european-region-2018>

INWG's Work Package 3.2 – Excessive Amplitude Modulation, Wind Turbine Noise, Sleep and Health
Author: Dr Christopher D Hanning BSc MRCS.MRCP MB BS.FRCA MD Honorary Consultant in Sleep

Medicine, University Hospitals of Leicester, remains authoritative despite the attempt to downplay its importance in the WSP Phase 2 AM report.

b) Where there is scientific uncertainty, The Noise Policy for England says the precautionary principle applies i.e. the polluter (not the public) pay

The Noise Policy for England (published in March 2010) in its Guiding Principles states,

"Using Sound Science Responsibly – Ensuring policy is developed and implemented on the basis of strong scientific evidence, whilst taking into account scientific uncertainty (through the precautionary principle) as well as public attitudes and values"; and

"Achieving a Sustainable Economy – Building a strong, stable and sustainable economy which provides prosperity and opportunities for all, and in which environmental and social costs fall on those who impose them (polluter pays), and efficient resource use is incentivised."

Bearing in mind the WHO's findings and that ETSU-R-97 is much more relaxed in the amount of noise that nearby residents may be expected to accept for most other industrial noise sources, it would not be discriminatory if wind turbine noise was considered in line with these comments and at least assessed under BS4142.

c) The use of the statutory nuisance regime to address excess amplitude modulation is not working

It is unacceptable to permit a development that proposes the use of the statutory nuisance regime to address excess amplitude modulation. As shown by the case involving Cotton Farm Wind Farm in Cambridgeshire where a legal technicality has stalled proceedings, relying on the statutory nuisance regime places an unacceptable burden on any resident who may embark on this course; the case remains live and the noise continues unabated to the continuing detriment of those living in the noise.

While the case is in the Magistrates' Court and so does not establish a legal precedent, it appears to have stalled because it involved the prosecution of a criminal case rather than a civil one. This has had implications for the duties of disclosure imposed on a prosecutor and the burden of proof to a criminal standard (and it should be remembered that the Police and Crown Prosecution Service have recently been severely criticised for failing to comply with the disclosure requirements). The six month time limit for commencing proceedings has also been a factor. All of this is a considerable burden for a private individual who may be suffering sleepless nights as a result of wind turbine noise.

BEIS is respectfully asked to please accept that Statutory Nuisance is not a suitable avenue for residents to use should they suffer from wind farm noise nuisance and to specifically consider the law of nuisance and the full implications of the Supreme Court Judgment in *Coventry v Lawrence* as per INWG Work Package 6.1

It should be noted that the *Coventry* judgement was followed in a wind turbine case in Aberdeenshire where the Sheriff found that a statutory nuisance had been committed on the evidence of the Pursuers (*Milne v Stuartfield Windpower Limited*). While expert evidence appeared to have been limited, the Sheriff considered that the witnesses were reliable and so had made out the nuisance. Although this

case was taken using Statutory Nuisance powers, the law in Scotland is significantly different from that in England in that, in Scotland, proceedings for Statutory Nuisance are civil and not a criminal prosecution.

INWG is also aware of the very recent judgment in R(on the application of Richards) v Environment Agency and Walleys Quarry Limited [2021] EWHC 2501 (Admin) which applied Human Rights issues to a nuisance caused by smell. While we have not yet studied the full implications of this judgment, when people have moved house because of sleep deprivation we believe it may also be relevant to wind farm noise nuisance cases.

d) Discharge of Planning Conditions

Planning Conditions are being discharged in ways that contradict the original condition, for example:

The time limits on the Batsworthy noise monitoring survey were abandoned and without this leverage, a 6 month exercise was prolonged for 4 years; and

The condition requirement to perform tonal assessments on all valid noise measurements was abandoned in the detail for tonal assessments which required only that tonal assessments were carried out on “some” valid measurements which led to differing tonal penalties with each assessment and the correct tonal penalties were never ascertained.

To prevent such shenanigans that has invariably been to the detriment of the public, any wind turbine noise conditions should contain their full detail and not require discharge of their detail.

(Q1.4) Compliance determination and enforcement

(Section ix)

a) The principle that bringing a wind turbine site into operation within its noise limits relies on complaints from the public is untenable; it gives the wind turbine operator's license to operate outside the permitted noise levels.

Once a wind turbine site is operational, ETSU-R-97 sets out the process for dealing with noise levels that may be above the limits. This is like closing the stable door after the horse has bolted because it relies on members of the public complaining about the noise levels to their LPA, Local Planning Authority (assuming they even know they can). Worse still, this requires that the complainant puts their property on the line, it being necessary to declare a complaint upon the sale of the complainant's home. In an environment where experience shows councils are slow and indeed fail to enforce noise planning conditions on wind turbine sites, this is an impractical and untenable position to inflict upon members of the public. In short, it gives the wind turbine operator's license to operate outside the permitted noise levels.

Even assuming a member of the public complains, such conditions causing noise complaints are watered down through averaging with many weeks worth of other measurements using the L90 statistic which removes 90% of the higher level data in each 10-minute measurement sample.

In this respect INWG believe that *Coventry v Lawrence* is very important in the way that the judgement considers the position where a nuisance is alleged to an operation which has been given planning permission. In short, does compliance with a planning condition mean that there can never be a nuisance? This is considered in INWG's WP6.1. As government document NANR277 states, "Compliance with planning controls can avoid Statutory Nuisance but does not provide an automatic defence against the normal test of statutory nuisance."

b) The noise monitoring surveys do not identify all / the full extent of the exceedances of the noise limits.

The introduction of noise monitoring surveys to bring a wind turbine site into operation within its noise limits is half hearted because it does not identify all / the full extent of the breaches of the noise limits.

By way of explanation, ETSU-R-97 requires that noise levels are assessed at the residence where the complaint occurred, in the same operational and meteorological conditions as those present when the complaint occurred.

Whereas the noise monitoring survey assesses noise levels averaged over a number of months at a number of locations around the site and generally in down wind conditions only (although at Den Brook Hayes McKenzie Partnership attempted to average noise levels across all wind directions until the LPA intervened).

Putting aside the implicit averaging issues within ETSU-R-97 and that the human ear does not hear average noise levels, deploying ETSU-R-97 to address noise complaints can be likened to using an actual speed camera check whereas deploying a noise monitoring survey can be likened to using only an 'average speed camera check. i.e.:

- Average speed cameras clock your entry and exit time into say a 50mph zone. Even if you drive at 70mph through the first half of the zone and 30mph through the rest, you wouldn't be recorded as breaking the speed limit because your average speed is still 50mph. In other words the noise monitoring survey doesn't tell you what's actually going on.
- However using proper speed cameras along this 50mph zone, you'd be clocked at 70mph breaking the speed limit. In other words ETSU-R-97 is more stringent than a noise monitoring survey.

c) It is taking years to identify and address any breaches of the noise limits if they are identified or addressed at all; as such the public are being exposed indefinitely to unacceptable noise levels.

There are further major concerns regarding the use of ETSU-R-97 and noise monitoring surveys to address noise levels after a wind farm is constructed; namely that it is taking years to identify and address any breaches of the noise limits if they are identified or addressed at all. This means the public are being exposed to exceedances of wind turbine noise limits for years; and as Robert Davis

Associates (formerly of ISVR, the DTI Noise Working Group and RUK's AM investigation Team) notes in their submissions on Batsworthy, "the ETSU limits themselves are recognised as being at or close to the threshold of acceptability.". The implications of this statement are that any exceedances of the noise limits are unacceptable.

Using ETSU-R-97 to address complaints takes weeks as a minimum and often extends to many months i.e. the specific operating conditions causing complaint are not being adequately investigated in a timely manner.

At Fullabrook, Batsworthy and Cotton Farm, it was four years before exceedances identified in the noise monitoring surveys were stopped; and at Denbrook, after years, the LPA has still not discharged the site as having met the noise monitoring survey noise limits; and at Cotton Farm, independent evaluation of the noise levels show continued breaches of the noise limits.

Any future use of noise surveys could no doubt be hastened if full time operation of the wind turbines is limited until the surveys find no further breaches of the noise limits.

d) Noise Planning Conditions are not being enforced

As if to add insult to injury, the substandard protection granted residents, is not being delivered. While ETSU-R-97 is prescribed under government guidance for managing wind turbine noise, noise monitoring surveys are not. It is therefore of grave concern that ETSU-R-97 appears to be usurped in a number of cases by the deployment of an even less stringent approach, that is to say, the noise monitoring surveys, for example:

At Fullabrook, upon achieving compliance under a noise monitoring survey, the LPA proposed that complaints would be addressed using statutory nuisance instead of ETSU-R-97. There is no record of Hayes McKenzie Partnership (for the wind turbine operator) or Robert Davis Associates (for the LPA) attempting to correct the LPA's misunderstanding of the proper process.

<https://www.northdevon.gov.uk/media/377123/minutes-of-the-fullabrook-windfarm-public-meeting-feb-16.docx>

Likewise at Batsworthy, the LPA tried to jump straight from the noise monitoring survey to statutory nuisance thereby bypassing the deployment of government guidance i.e. the use of ETSU-R-97 to address complaints. Again there is no record of Hoare Lea Associates (for the operator) or Robert Davis Associates (for the LPA) attempting to correct the LPA's misunderstanding of the proper process; it was residents who enlightened the LPA who in turn were grateful to have a planning condition to lean on before having to consider statutory nuisance.

And at Cotton Farm, the LPA appears convinced that as a noise monitoring survey has been completed, complaints need not be addressed using ETSU-R-97. Instead the LPA claims the only recourse for complainants is through statutory nuisance. Once again there is no record of Hayes McKenzie Partnership attempting to protect residents by ensuring that government guidance is followed i.e. that ETSU-R-97 is used to address complaints. The problems with statutory nuisance have been highlighted above. In addition, the Walleys Quarry case mentioned above may force LPAs to take a more active role to ensure the nuisance is abated. However, holding LPA's to account can be difficult so the

establishment of a national authority, similar to those proposed in the BEIS Regulatory Road Map for shale gas extraction, with the knowledge and resources to operate on behalf of the affected LPAs, offers a route to ensuring the delivery of whatever protection the public are afforded by the government.

(Q1.4) Uncertainty

(Section x)

a) There is significant uncertainty about the impacts of the uncontained sound from wind turbines.

It is standard procedure to apply uncertainty to noise assessments; it is therefore bizarre that ETSU-R-97 does not most especially because there's plenty of uncertainty from manufacturer specifications, to wind shear calculations, to the efficacy of using ETSU-R-9 to protect public health and wellbeing. As such, uncertainty in favour of the public, should be a critical matter for consideration.

(Q1.4) Anything else not listed above (please specify)

Section xi)

a) Maintaining noise levels below the limits

Means of establishing regularly that a wind turbine site continues to operate within its noise limits, is deemed necessary for a number of reasons. It is proposed that a national authority with the knowledge and resources to do the job on behalf of the affected LPAs, ensures a wind turbine site continues to operate within its noise limits by regular provision from the operator of:

- The operating schedule and the SCADA data to demonstrate adherence to that schedule; and
- A repeat at least annually, of any assessment used to demonstrate that the site was operating within its noise limits.

b) Natural Justice

A failsafe route is required to secure provision from the operator directly to the public, all the raw data including audio recordings and calculations from any noise assessment so that members of the public can independently verify the assessments in line with the principles of natural justice. This is not an issue where commercial confidentiality should come into play

In each case the complainant's appointed Acoustician should be an equal party to the setting of any complaint and compliance methodology and has access and oversight throughout the period the complaint is live, until a satisfactory resolution is achieved.

c) Professional Judgement

The use of “professional judgement” needs tempering, for example at Fullabrook, both Hayes MacKenzie Partnership (for the operator) and Robert Davis Associates (for the council) claimed that the exceedances at six locations were unlikely to be the wind turbines.

Quite what was consistently making a noise when the turbines were on and not making a noise when they were off, if not the turbines, is unclear. See 6.3 at this link:

https://www.northdevon.gov.uk/media/377007/2948_r1_2015-10-30_fullabrook_wind_farm_2015_noise_compliance_assessment_ext.pdf

Experience or knowledge of wind farm or turbine design influence on sound emissions

Q2.1: Do you have any specific experience or research knowledge of the potential influence of wind farm or wind turbine design or age on sound emissions? (Choose one answer)

☒ Yes

☐ No

If you answered ‘yes’ to Question 2.1, **please proceed to Question 2.2**

If you answered ‘no’ to Question 2.1, **please proceed to Question 3.1**

Influence of modern wind turbine or farm design on sound emissions

Q2.2: Please could you briefly outline how the design of more modern wind turbines has influenced the sound emissions (including sound characteristics), compared with wind turbine designs prevalent around the time of the preparation of ETSU-R-97?

ETSU-R-97 was published in 1997 since when turbines have increased significantly in size and power from blade tip height of 60m to current applications of up to 260m and from generating capacity at 600kW to 5.6MW leading to increase noise levels.

Q2.3: Please could you briefly outline any knowledge or evidence for how the age or wear and tear of wind turbines could influence the sound emission characteristics, including AM?

Evidence of increased noise levels as turbines age can be seen in the Bald Hills case in Australia.

2.4: Please could you briefly outline any suggestions you have for how the prevalence of AM from various turbine models and ages could be investigated?

By measuring noise levels across the spectrum using shorter duration Leq levels over perhaps 1-minute intervals across the UK wind farms with parallel audio recordings.

Q2.5: Please could you briefly outline any knowledge or evidence for how the design of wind farm layouts could influence cumulative noise impacts?

Current wind farm layouts are proving turbines are too close to each other. The noise emissions often vary turbine to turbine due to blade speed etc when the slight variations of blade rotations synchronize and desynchronize and generate pressure pulses of sound. This adds to the unsettling variation of noise emissions, especially at night which is very disturbing to many residents. The only way to combat this, from the design point of view, is to increase the set back distance of individual turbines from habitation (turbines up to 130m should be at least 1.5km away, taller should be further) and spacing between turbines should be much greater so that noise impacts from multiple sources are lessened.

Any other evidence

Q3.1: Please could you identify any publicly accessible evidence you are aware of that could be relevant to the development of any future UK wind turbine noise assessment guidance and is not already mentioned in your previous responses?

No entry made in this section.

Guidance development and maintenance

Q3.2: Please could you briefly outline any suggestions you have for how any future UK wind turbine noise assessment guidance could be developed and maintained to provide a stable platform for development planning and assessment, while ensuring that it is kept up to date with robust scientific evidence?

Future assessments need to be conducted at all frequencies. Even back in 2003 Hazel Guest raised this concern. *"Inadequate standards currently applied by local authorities to determine statutory nuisance from LF and infrasound. Hazel Guest, UK Noise Association 44 Beaufort Place, Thompson's Lane, Cambridge CB5 8AG. Received 5th March 2003.*

ABSTRACT Knowledge of the latest results in Low Frequency Noise (LFN) and infrasound research are not being transmitted, either to government whose job it is to legislate on standards of noise and vibration, or to local authority officers whose job it is to look into complaints and enforce standards. The dismissal of

complaints is frequently based on inappropriate techniques such as the application of A-weighting, a lack of understanding of vibration transmission including building resonance, and a lack of basic understanding about the perception of low frequencies by complainants, for instance the lowering of the lower audibility threshold arising from exposure. This paper asks those involved in research to ensure that their relevant findings are more widely disseminated, along with advice to legislators and local authorities on measurement, information on LF and infrasound resonance in buildings, recommendations for appropriate standards to be used in assessing LF and infrasound as a Statutory Nuisance, and information about the effects of long term exposure. There is a need for more research in situ into specific effects." Addressing this failure is now urgent, given the acknowledgment by WHO 2018 "Wind turbines can generate infrasound or lower frequencies of sound than traffic sources" and that turbine sizes and blade lengths have exponentially increased from under 30m in length, to in excess of 60m in length. Likewise, Blade tip heights have increased from under 60m to up 260m with no commensurate increase in set- back distances from homes. It is simply not good enough to avoid this issue by stating turbines are quieter and therefore there is not a pressing concern.

Feedback

Thank you for completing this survey. Your responses to this engagement will be an important part of ensuring that the wind turbine noise assessment guidance in the UK is consistent with Government policies, and remains suitable.

If you have any feedback on this questionnaire or the engagement process, please send your comments to windfarmnoiseguidance@wsp.com