**INSTITUTE OF ACOUSTICS**



**IOA CONSULTATION DOCUMENT ON THE**

# "GOOD PRACTICE GUIDE TO THE APPLICATION OF ETSU-R-97 FOR WIND TURBINE NOISE ASSESSMENT"

**JULY 2012**

**FOREWARD**

** PLEASE READ **

This consultation document has been produced by a working group on behalf of the Institute of Acoustics consisting of the following members:

| | |
|---|---|
| Matthew Cand | Hoare Lea Acoustics |
| Robert Davis | RD Associates |
| Chris Jordan | Northern Group Systems (Environmental Health) |
| Malcolm Hayes | Hayes McKenzie Partnership |
| Richard Perkins (Chair) | Parsons Brinckerhoff Ltd |

This document is designed to be read in conjunction with the "Discussion Document on A Good practice Guide to the Application of ETSU-R-97 to wind turbine noise assessment" dated July 2012, and includes questionnaire style responses. Respondents to the consultation are encouraged to provide their comments on this form. A word version has been provided to allow respondents to increase box sizes as required.

All comments on the consultation draft should be sent electronically to:

ETSUCONSULT@IOA.ORG.UK

Alternatively, written responses can be sent to:

IOA NWG GPG Consultation Feedback
Institute of Acoustics
3rd Floor St Peter's House,
45-49 Victoria Street,
St Albans,
Herts.
AL1 3WZ

The closing date for the receipt of comments is **Friday 28th September 2012**. Late comments may not be reflected in the final document.

## CONTENTS

# 1 Introduction to the consultation

## 1.1 Background

1.1.1 The Institute of Acoustics Noise Working Group (IOA NWG) has prepared two documents for the purpose of consultation to IOA Members and other interested parties on what should be considered good practice in the application of ETSU-R-97 for wind turbine noise assessment.

1.1.2 The IOA NWG has tried to set out the main issues in a way that explains the rationale behind those issues. The intention of the IOA NWG post-consultation is to be as definitive on what can be considered as “good practice” as possible for the final document, but at this consultation stage, some aspects have been discussed in more depth to promote discussion, and to ensure that an informed response to the consultation can be provided.

1.1.3 The second consultation document is called the “DISCUSSION DOCUMENT ON A GOOD PRACTICE GUIDE TO THE APPLICATION OF ETSU-R-97 FOR WIND TURBINE NOISE ASSESSMENT”, which sets out the issues, and what might be considered to be good practice. Areas not covered by ETSU-R-97 (such as turbine noise propagation), or areas where the IOA NWG suggest that specific consultation responses are required, have been highlighted in yellow, and a specific response box with an explanation has been provided below.

1.1.4 The Institute of Acoustics is also holding a workshop where members can discuss the issues in more depth.

1.1.5 Feedback is encouraged on all aspects of the document, whether positive or negative, with suggestions for omissions and amendments as appropriate.

## 2 Consultation Aims and Responses

### 2.1 Chapter 1 (General)

2.1.1 Please provide comment in relation to the Background, Project Aims and Objectives, and Scope of the Document:

Firstly, in spite of any criticism I have, I acknowledge the hard work put in by the members of the group in trying to untangle a complex subject. Most of my criticism results from the fact that the aim should have been a complete replacement document for ETSU-R-97 not a patch-up.

In addition, some of the problems in the discussion document arise because it is a discussion document and not a GPG. I would request that members have an opportunity to comment on a draft of the GPG itself before it is finalized and that is likely to be more productive.

At the risk of repeating what I have said previously elsewhere this review is not a proper independent review by the IOA because, we are told, its terms of reference are dictated by and it is largely funded by DECC. The review does not include the limits which "are government policy". If ETSU-R-97 is government policy then the whole document is government policy, not just the noise limits, so we are not permitted to review anything. This restriction is ridiculous because there is nothing to stop the IOA setting up an independent working group to examine any aspect of government policy it feels needs looking at. If the IOA were to do this in a proper professional manner then it would not allow government to dictate terms.

Not being able to discuss limits does not only affect discussion of the limits per se but shackles proper discussion on other matters – such as WHO guidance, choice of day lime limit, advice on Financial Involvement and cumulative noise issues. This has resulted frequently within the discussion document in vague and inconclusive advice – which is precisely what is not required. I will deal with some of these points individually in my response. As can be seen in my answers to some of the questions, not discussing noise limits will have the effect of raising some noise limits that have been adopted locally back to a higher level. The Institute will therefore be seen as the organization that raised wind farm noise limits.

Apart from the individual issues the document is far, far too long and far, far too vague. Whilst I appreciate that this is a discussion document, I suggest that the GPG itself is no more than six to eight pages. It needs to be crisp and to the point without scope for interpretation. If there are any areas where it is not possible to provide short simple guidance then none should be provided and a statement made to that effect. It would be the worst of all worlds to provide a document that is a discussion on the difficulties of providing guidance – and that is what has been done in the discussion document.

On this last point, in some sections, paragraph after paragraph is vague and imprecise but I will pick out two examples in this box of what I mean. In 2.1.3 "it is therefore usual to produce a predicted 35dB LA90 noise contour". Does this mean that the GPG recommends that this is done or is it saying "mostly people do this but you can choose to do it how you like?" 2.1.8 –we need a statement of what is to be done or simply do not mention the subject at all. I don't intend to repeat this comment in each section but it should be noted that it does apply to nearly all of them.

The GPG will need a clear definition of the scope of projects to which it refers. This is mentioned in 1.3.1 but without any recommendation. ETSU-R-97 is clearly designed for projects that have wider national and global benefits (executive summary para 11). Does a 10kW single turbine really have such benefits? Do two 50kW turbines or three 225kW turbines? Is it right that, as is happening regularly all over the country, a 20kW turbine is given higher noise limits than an 80MW wind farm. The size and number of turbines to which the GPG applies must be carefully defined otherwise we will end up in a worse position than we are now. And what if anything is the status of the BWEA document. Is it rejected by the NWG? If not, to what developments does it apply? How will any definition of the scope sit with local authorities who have already defined categories of turbines (eg <50kW, 50 to 500kW and >500kW) and assigned different assessment methods to each? Will the GPG undermine what they have done locally?

The definition of the scale of developments is very important. Are smaller developments to be permitted

less robust background noise assessments or less robust wind measurement procedures. That might well be a reasonable approach. If so, is it reasonable that they should be treated any differently from a normal industrial development?

The other point that will need to be made clear is whether the GPG takes precedence over ETSU-R-97 or not. Where it differs – for example in the proposals for setting the day time limit – which is to be used?

### 2.2 Chapter 1.4 Noise assessment Philosophy

2.2.1 The IOA NWG considers that the assessment philosophy behind ETSU-R-97 is not always clearly understood, and has set out what it believes is the correct interpretation of the guidance. Please provide feedback on the assessment philosophy:

I don't understand what this section is supposed to be about. The question (above) says it's the assessment philosophy behind ETSU-R-97. The heading at 1.4 says its about general noise assessment philosophy. The intro at 1.4.1 says its about the philosophy of the consultation document itself. Most of ther other sections are a description of certain selected parts of ETSU-R-97.

### 2.3 Chapter 1.5 Engagement

2.3.1 ETSU-R-97 is clear that Engagement is a necessary part of the wind farm noise assessment process. Please provide comment on what the IOA NWG considers is "good practice in this regard:

This is an important section and I think clear recommendations are required as to how developers might be expected to engage with surrounding resident as well as EHOs. Encouragement is not enough.

### 2.4 Chapter 2 Baseline Data Collection

2.4.1 Please provide feedback on Chapter 2.1 Scoping for Baseline Noise Surveys

.

Section 7 and pp99 et seq of ETSU-R-97 need some brief but clear guidance – it is not clear at present. Section 7 appears to start off by discussing baseline measurements, but then later on the first page it clearly moves into compliance monitoring. Then, on the bottom of page 84 is moves back to baseline and then on page 87 back to compliance testing.

On page 99, although the section as a whole is about planning obligations/conditions it starts off with the baseline measurements.

With respect to 2.1.6 this opens up several difficult issues which have not been dealt with.

- using data from another site would only be valid if the wind speeds on the two sites are always the same.
- for compliance testing the wind speed needs to be measured at the same location as the baseline wind measurements (like for like). So compliance testing would mean the use of someone elses met mast.
- We may not know whether the original data is robust because we may have no access to it.
- Data measured years ago may not be as reliable (eg windshields may not have been so good).
- Doing noise measurements when a property is upwind of turbines may result in distorted results (they may not be representative of all wind directions or of the wind direction which will be worst case for future turbine noise).
- As turbines increase in height doing measurements when properties are upwind may no longer reliably eliminate existing turbines – particularly in certain topography.

2.4.2 Please provide feedback on Chapter 2.2 Noise Measurement Equipment

Some suggestions:

- All noise calibration figures should be recorded whether they have drifted or not.
- Anemometer clock drift (or non-drift) should be recorded
- Noise Clock drift (or non-drift) should also be recorded.
- All these should be done at the start and finish of the recording and at every intermediate visit.

2.4.3 Please provide feedback on Chapter 2.3 Timing of Surveys

In 2.3.3 a correction for non-typical wind shear is proposed but in 2.3.4 a similar correction for non-typical background noise is rejected on the grounds that "there is no reason to suggest" that any change is made to the procedures. This is not logical. If wind shear is to be incorporated into background noise (as it probably should) then the question is whether the whole background noise procedure needs addressing. A more robust procedure for obtaining "typical" background noise should be proposed.

In quiet rural areas it seems there is sometimes more variation between the results from different consultants or different times of year than there is from different locations. Much of this is probably due to micro-siting of equipment. Either the whole procedure needs tightening up and monitoring carried out over at least two separate times of year in a highly controlled way or default wind induced background noise levels should be adopted – moderated if necessary by measured non-wind-related noise.

See also my answer to 2.4.8.

2.4.4 Please provide feedback on Chapter 2.4 Wind Speed Measurement

The distinction in best practice between different scales of development should be clearly defined – unless the overall scope of the GPG is limited to a particular scale. I see no reason why a strict policy of tall mast measurements (or SODAR/LIDAR) should not be used for developments above a certain scale. On the other hand something very much less expensive would be appropriate for a 6kW turbine.

It might also be logical that if wind is measured other than by a tall mast then (because the uncertainty is greater) the applicant should demonstrate a greater margin inside the limits.

2.4.5 Please provide feedback on Chapter 2.5 Rain measuring equipment

Much clearer guidance is needed on dealing with the effects of rain on watercourses. Noise levels can rise very fast and then the noise can carry on reducing for several days – not just a few ten minute periods. ETSU-R-97 clearly intends that continued high water flow is dealt with but it is hardly ever done.

2.4.6 Please provide feedback on Chapter 2.6 Synchronisation of noise, wind and rainfall measurements

All the data on BST, GMT, start or end time for all the measurements should be recorded in the assessment – including particularly what happens when equipment straddles a time change

2.4.7 Please provide feedback on Chapter 2.7 Durations of surveys

This section is really superceded by 2.8 and 2.9. I suggest good practice would be that there is no recommended duration but that everything is covered by the next two sections.

2.4.8 Please provide feedback on Chapter 2.8 Range of wind speeds during noise surveys

I cannot agree with the idea that it is not necessary to cover all wind speeds up to 12m/s. Whatever the original reason for this, in order to obtain a reliable best fit curve of the background noise – even at 5, 6 or 7m/s – we need data at high wind speeds. Wind related noise may not start to be significant until 8m/s.

In any case, since candidate turbines are usually used in the assessment we can't be certain that turbine noise won't carry on rising with the chosen turbine. That might be unlikely today but might not be in the future.

There is an important general point here as well. Accurate and representative background noise levels are essential to form a baseline for the protection of residents. The whole background noise procedure needs to be strengthened not weakened.

Background noise measurements for larger turbines should be carried out during two different seasons of the year.

**2.5 Chapter 2.9 Required size of data set**

2.5.1 The minimum size of the dataset to be obtained to ensure that the assessment is sufficiently robust has been debated at many Planning Inquiries, and the consensus view of the IOA NWG has been proposed. Feedback on this issue is welcomed:

As I mention above, a dataset between cut-in and rated power is not good enough. Also, developers only have candidate turbines so we do not know what cut in and rated power might be for the final turbine..

This section and some of the others here touches on the matter of the scope of the guidance in terms of turbine size. Most of the background noise section is written as if it applies to large turbines in wind farms. Is it the intention of the NWG that this should apply to a single 6kW turbine for example?

The idea of background noise surveys confined to certain wind directions is introduced. That is a major point and if it is raised here it needs to be addressed in the overall background noise recommendations. I don't think it has been. Are we measuring background noise in limited wind directions in some cases – if so, which cases? It might be reasonable to do so in all cases. Unless this is clearly stated the position is more wooly than it was before.

There does not appear to be anything about the quality of the dataset, so I will put it in here. Appendix C of ETSU-R-97 touches on this but does not seem to draw any conclusion. The implication of Appendix C is that the dataset ought to approximate to a normal distribution and that perhaps the percentage of time that background noise levels are below the best fit curve by a certain amount is relevant. Some sort of clear guidance is needed on this. For example, if a dataset consists of two bands of data with the best fit line running between them the reason ought to be investigated – why are there apparently two sets of data? Similarly, if there is a large spread of data then the consultant ought to investigate why. Something needs to be added here.

**2.6 Chapter 3 Data Analysis & Noise Limit Derivation**

2.6.1 Please provide feedback on Chapter 3.1 Analysis of Background Noise Data:

Leaving aside my general comments in 2.1 above (and this section is far too long and indecisive) most of this seems fine. However, there seems to be some overlap between 3.1 and 3.2. Are two sections necessary?

2.6.2 Please provide feedback on Chapter 3.2 Derivation of Prevailing Background Noise:

See 2.6.1 above.

**2.7 Determining the fixed limit**

2.7.1 The HMP report requested further clarification on the setting of fixed limits. Please provide feedback on Chapter 3.3 Determining the fixed limit:

The first point here is that the determination of the fixed limits seems to me to be outside the terms of reference which says that limits cannot be discussed. Overall, I think the proposals in this section make the already confused text of ETSU-R-97 even more confusing.

3.3.11 (and 3.3.4) is misleading. Test 1 is the number of properties, it does not take into account the size of the scheme – that may be part of another test but number of properties is the ONLY consideration in Test 1. So consideration of wind direction and the relative size of the scheme cannot be considered here. That would be re-writing what ETSU-R-97 says and whilst that may need to be done that is not the working group brief and it would be quite wrong for them to pick and choose bits to re-write.

Test 2 is more ambiguous in ETSU-R-97. Is it size of development or loss of generating output that is the determining factor? It seems to me that it must be the loss of generating capacity that is the important point – not the size of the wind farm. If a 100MW wind farm would lose no output if the limit was 35dB rather than 40dB then there is no reason, under test 2, why it should not have the lower figure. 3.3.11 seems, like ETSU-R-97 to confuse the two.

Test 3 is even more confusing in ETSU-R-97. The comparison between turbine levels and background noise levels is the right approach. The categorizing of developments as in 3.3.11 in a very general way is not necessary because the test can be made using calculated turbine noise and measured background noise levels. That is much easier than a debate about whether locations are sheltered or have high wind shear. This does not clarify the position at all.

This does not resolve the ambiguities in ETSU-R-97. What is more it introduces two other factors to confuse the issue – wind direction in determining the number of properties affected and whether the three tests have equal weight in planning terms – without saying precisely what to do.

There are two more general and more serious difficulties here which emphasise why this part of ETSU-R-97 needs a complete re-think. The first is that an unscrupulous developer might pack turbines on to a site so as to just meet the 40dB limit and then argue that to reduce the limit to 35dB would result in a significant loss of production. The second is that any clarification of the fixed limit undermines the efforts of an increasing number of local authorities in very quiet rural areas to encourage wind farms with lower limits typically 35dB day irrespective of size. There is no evidence that this has restricted the number of developments but merely improved their quality.

The merging of day and night limits is discussed in 3.3.15 onwards. The suggestion in 3.3.18 seem reasonable but needs to be more positive and precise. However, if this only happens where the developer and the Council agree it means it will hardly ever happen and it would be better to remove this qualification – after all the Council and the developer do not have to agree the lower day time limit.

The section on financial involvement is inadequate. 3.3.21 merely repeats what ETSU-R-97 says. 3.3.22 considers one case of many (what if a tenant gets paid £100 per year to have a pole in the garden? What if an owner occupier gets paid a similar sort of wayleave?) There is a dozen or more different scenarios that need clarification.

**2.8 Noise Predictions**

2.8.1 ETSU-R-97 does not describe a method to predict the immission levels at the nearest residential properties, but clearly demonstration of the likely noise impact at the nearest receptors is required in any planning situation, and this must be reliable and robust. Feedback is therefore requested on the following aspects of the Prediction Methodology.

2.8.2 Please provide feedback on Chapter 4.2 Turbine Source Noise Data:

This is all rather vague. I suggest what is needed is a precise description of what is acceptable.

See also 2.8.3 below.

2.8.3 Please provide feedback on Chapter 4.3 Noise Propagation model and input parameters:

I would delete 4.3.1 to 4.3.4.

4.3.5 is not precise enough. It would still allow a calculation of propagation with G=0.5 using either measured figures or warranted figures – if the warranted figures were the same as measured which is often the case because of the small print in the warranty. Warranted levels should be left out – they do not have a precise enough definition - and reference made to Apparent SWL and Declared Apparent SWL only.

2.8.4 Please provide feedback on Chapter 4.4 Directivity:

As turbines get higher the shadow zone will get further away. I suggest there should be a limiting distance related to hub or tip height for upwind reductions to be applied. This might also need to be increased for concave ground. I suspect more research is needed on this

Should wind shear not be a separate level 2 heading (4.5)?

**2.9 Cumulative Issues**

2.9.1 The IOA NWG has debated the various cumulative issues that arise when considering wind turbine noise, and has set out the key issues as the basis for discussion. Particular feedback is requested on this aspect.

Section 5 sets out the position clearly and comprehensively and reaches the only possible conclusion – that there is no reliable solution other than strategic planning. Without strategic planning it is inevitable that wind farms will have to be refused because of cumulative impact or that people will be unreasonably exposed to noise.

Guidance is also needed as to whether all turbines of whatever size are to be included in the cumulative assessment. This may relate to the division of developments by size and number of turbines. If smaller developments are assessed in the same way as small industry generally – might they be excluded from the cumulative assessmenrt?

I suggest there are other factors complicating the cumulative noise issue that need addressing. For example:

- How to work out individual limits from a cumulative one where there are two different sets of background noise levels at the same property.
- How to deal with differential wind speeds on two or more sites.
- How to deal with applications that comply with ETSU-R-97 but increase the duration of exposure (Gorsedd Bran case).
- Is the situation in a particular case such that an enforceable planning condition cannot be devised.

**2.10 Planning Conditions**

2.10.1 Please provide feedback on Chapter 6.1 Discussion:

I'm not sure what the NWG is saying here. 6.1.2 says it cannot give guidance but goes on to suggest a planning condition.

2.10.2 Please provide feedback on Chapter 6.2 Simplified approach for setting noise limits:

This is under planning conditions when it clearly ought to be under the day time limit.

The simplified approach as suggested is counter to ETSU-R-97 and is a quite unacceptable suggestion in quiet remote rural areas. This is because the fixed lower day time limit depends, in part, on the background noise in the location considered (see 3.3 of the discussion document). It is therefore not possible to set the fixed limit at a value between 35 and 40dB without knowing the background noise level. This is precisely why, when there are no background noise levels ETSU-R-97 requires that the fixed level is 35dB – the lowest value in the range.

I thought noise limits were outside the scope of the NWG.

### 2.11 Reporting Results of the Noise Assessment

2.11.1 Please provide feedback on Chapter 7 Reporting Results:

No other comments.

### 2.12 Other Matters

2.12.1 Please provide feedback on Chapter 8.1 on Compliance Measurements:

This needs to be a precise set of instructions rather than what is effectively a discussion of current practice. In addition to the usual things, items needing to be carefully considered and precisely set out are:

- Exactly which data are to be used to assess compliance – in particular wind direction. Several recent compliance tests have simply averaged the whole data for the test period on the grounds that the planning condition does not specify anything.
- In general there should be precise instructions as to procedure where the planning condition is silent.
- Only data for periods when turbines are operating normally should be used.
- How is constrained running of turbines or mitigation by switching turbines off to be dealt with? (eg, how do we know whether a turbine is off because it is supposed to be or because it is not working). This suggests that that any development which uses constraint to meet noise levels should have an accompanying "operating scheme".
- Although the location of wind measurement is discussed, this needs further consideration. The whole principle of the assessment process is that the background noise re wind speed curve derived at assessment stage is the baseline intended to protect amenity. It is therefore essential that the compliance wind speed measurement conditions are made in as similar a location as possible.

2.12.2 Please provide feedback on Chapter 8.2 on Character Penalties:

No comment on tonal correction.

As turbine size increases it becomes more urgent that a penalty system for AM is produced, though I agree that it is not possible at this stage (unless perhaps a subjective test is used). If this is not addressed wind farms will start to be refused because of the risk of AM.

### 2.13 Recommendations for Further Research

2.13.1 Please provide feedback on Chapter 9 on Recommendations:

Included in comments above.

# 3 Annex

## 3.1 Annex A

3.1.1 Please provide feedback on whether the IOA NWG has met the aims of the Terms of Reference, or whether further aspects need to be included:

| |
|---|
| No Comment |

## 3.2 Annex B

3.2.1 Please provide feedback on terms to be included in the Glossary:

| |
|---|
| No Comment |

### 3.3 Annex C

3.3.1 Please provide feedback on the revision of Standards & Guidance:

Section 4 seems to suggest that no change is required to the 43dB night time limit because of the revised WHO guidance. Many local authorities are now agreeing or asking for 38 or 40dB for night noise levels as a matter of course. The updating of the night time level to 38dB as a result of the later WHO guidance was recently confirmed by the reporter in the Spittal Hill decision in Caithness in his recommendation to Scottish Ministers who accepted his recommendation to refuse the application.

The IOA will soon be the only organization left trying to defend a night time level of 43dB.

### 3.4 Annex D

3.4.1 Please provide feedback on whether the flow chart adequately reflects the process:

No comment

### 3.5 Annex E

3.5.1 Please provide feedback on this discussion on wind shear:

I'm not sure that this should be part of a GPG. It seems to encourage people to use less robust methods of assessment. This also comes back to the scope that GPG is intended to deal with – if it is to deal with small turbines then this needs to be addressed – but separately from larger developments. In particular I think the table is very dangerous. There is too much variation in shear locally and it is likely to be used by people to avoid proper shear measurements.

### 3.6 Annex F

3.6.1 Please provide feedback on the example planning condition:

I think the time has come to go back to a simpler set of conditions. (Andy McKenzie and I agreed a single page condition recently). The text has now got out of hand as more and more has been added in. There is too much cross referencing and too much scope for mistakes to creep in as the text is customized. It will have to be customized – for example to define the wind measurement details.

The tables should always have a last line "all other properties".

### 3.7 Your details

3.7.1 Please provide your name and contact details in case the working group wishes to clarify any of the points raised in your feedback:

Dick Bowdler

dick@dickbowdler.co.uk

The IOA NWG thanks you for your help in completing this document.

Richard Perkins
Working Group Chair