

Good practice guide is out

The IoA Good Practice Guide on how to use Etsu to determine wind farm noise is out. Will it solve the arguments that dominate the acoustics profession at the moment? Jack Pease offers six pages of analysis

Never let it be said that acoustics is dull. Last month saw the launch of the Institute of Acoustics Good Practice Guide on wind farm assessment and the Bristol delegates experienced at first hand how people can indeed get very passionate about very complicated algorithms.

Acoustics is not a simple topic and wind farm acoustics is about as complicated as acoustics gets. Add to that the political and human interest attached to wind turbines and you get a perfect storm. This was not a place for an acoustician to be if they prefer acoustical number-crunching to dealing with people and their human responses to noise.

If people weren't reacting badly to wind turbines, there'd be an awful lot less work for consultants – or, as noted by the IoA, so many well-attended conferences. Writing off protesters as nimbies (as a former IoA president did two years ago (*Noise Bulletin March 2010 p2*)) or persons with weak characters (*Noise Bulletin April p3*) completely misses the point. Whether or not they are justified, noise complaints are being made and need to be investigated and assessed.

Few would now claim that turbines are inaudible, many even accept that wind farm noise is a nuisance, but at the moment nobody has proved it to be a legal nuisance. Jane Davis argued her case at the High Court but her case against Deeping St Nicholas wind turbines was settled out of court with the wind farm promoter buying her house off her (*Noise Bulletin December 2011 p1*).

All this fuss about wind turbines noise can be traced back to the Etsu noise assessment methodology used to consent such wind farms. Developed in the 1980s for the turbines of the day, the methodology allows increased night time noise on the

basis that people will be asleep and thus unlikely to hear them. Etsu is accused of being unable to cope with modern large wind turbines which can keep turning even during night time temperature inversions which see stagnant air at ground level and the disappearance of background masking noise.

Public inquiries spend days arguing about the merits of Etsu – but in the end Etsu is policy which can't be argued about. The Government is refusing to countenance there are problems – wind turbine noise has been taken off Defra (who have a chance of understanding the noise issues) and put into the hands of Decc (whose job it is to get as many turbines working as quickly as possible). That said – this week's apparent planning softening suggests that the wind lobby may find the future is not as rosy as in the past (*see news, page one*).

Decc has commissioned research on wind farm noise but pointedly refused to put Etsu noise limits on the table for discussion. Instead it has studied the 'consistency' of Etsu use, using the turbine industry's favoured consultant. Then it set aside a modest amount of money to allow IoA to produce the good practice guide on how to use Etsu – with the stipulation that Etsu limits were off limits for discussion.

That proviso was – perhaps unwisely – accepted by IoA. It emphasises that just because it has done the guide does not mean it endorses Etsu. Tell that to ministers who happily refer to Decc's commissioning of wind farm consultants to review wind farm policy as 'independent' – and then minister John

Hayes referring to the IoA work on the guide as looking at wind noise from "a completely independent perspective" (*NB November 2012 p3*).

If those concerns caused mild disquiet, the process has been hugely undermined by the astonishing vacillation by the industry on amplitude modulation. Renewable UK launched its own investigation into amplitude modulation – thumping – not to be confused with low frequency noise or infrasound. Started in 2011, that review has stalled meaning the good practice guide cannot include critical recommendations on amplitude modulation.

As there have been few, if any, complaints against 'normal,' wind farm noise (they are all focused on the thumping), then arguably the guide is not covering the very topic that will cause most problems.

But it would be unfair to say the guide is useless. It is there to standardise assessment procedures for wind turbine noise – albeit for normal noise. If the guide is followed, it should put an end to the variability in consultants' assessments received by local authorities and ultimately planning inspectors. With better quality and agreed, standardised ways of presenting noise impacts, it is hoped to cut out hours or days of fruitless arguments at the planning stage or in the courts.

Terms of reference

Much criticism is directed at the Institute of Acoustics for not discussing Etsu limits – but the terms of reference of the study prevented them from doing so. It is thus worth looking closely at the exact terms of reference of the study, and how the IoA came to be involved.

The report explains: "In response to a request from Decc, the IoA has agreed to set up a working group to take forward the relevant recommendations of the Hayes McKenzie report on *Analysis of how noise impacts are considered in the determination of wind farm planning applications*" (*Noise Bulletin July 2011 p1*). The aim of the group will be to review the available evidence, and to produce good practice guidance on wind turbine noise assessment.

The membership of the working group was drawn from the membership of the IoA, and included representatives of the consultancy and local authority sectors.

The working group will report to the ruling council of the IoA. Progress and monitoring of the working group will also be fed back to a Government oversight group chaired by Decc.

The guide continued: "It should be noted that the purpose of the guidance document is to provide assistance to the target audience on technical matters relating to the application of ETSU-R-97 to wind farm noise assessments. It is not the role of the working group or the guidance document to debate or otherwise discuss the target noise levels, as this is a matter of policy for the respective Government departments.

"Editorial ownership of the document will be by the ruling council of the Institute of Acoustics."

Etsu limits in a nutshell

A quick reminder on what Etsu says, seeing as it is Etsu noise limits that are the heart of the problem. They are so controversial that IoA was barred from talking about them.

ETSU-R-97 allows for a combination of fixed and relative LA₉₀ limits using the criteria described in Chapter 3.3 of the guide as follows:

There is a **lower fixed limit**:

- During amenity hours: between 35 and 40dB (depending on three factors);
 - During night hours: 43dB;
 - For all properties with a financially involved occupier, 45dB;
- Or a **floating limit** based on the 'prevailing' background plus 5dB, whichever is the higher. These would apply at various wind speeds, and therefore it is normal to see the noise limits expressed as a graph of noise limits relative to wind speed for each location.

Guide provokes scepticism and criticism from some quarters

The good practice guide reflects IoA working party views – what about contrary thoughts? *Noise Bulletin* took soundings from those outside the process:

Dick Bowdler specialises in wind farm noise and has in the past been a vocal critic of Etsu: “Most of the guide will be a useful guide to good practice and help clarify some of the points of debate but I think it should have been more prescriptive. The section on Etsu limits will only create more arguments. For example, 3.2.4 records current practice in establishing day time limits. Does this mean current bad practice or good practice? – it does not say – it only says what current practice is.

“Section 3.2.5 says of the establishment of the day time limit: ‘It can be argued that assessing these factors does not represent an acoustic consideration but ultimately a planning consideration’. This, of course, is exactly what I have been arguing for over ten years – that the whole of Etsu is a planning consideration, not an acoustic consideration.”

Bowdler continued: “If we were doing a proper noise impact assessment we would be clearly stating the impact of the noise (as required by law) so that the planner could make the decision in the light of all the factors to be taken into consideration – not working to a set of limits from Etsu which purport to provide a planning balance.”

Consultant **Mike Stigwood** has been at odds with the wind industry in recent years. He says amplitude modulation is common, the industry says it is rare. He has set up listening rooms to try to convey what the difficult-to-measure noise sounds like (*Noise Bulletin* October 2012 p4).

Stigwood told *Noise Bulletin*: “As someone who has studied and experienced the impact of ‘compliant’ wind farms on communities, staying at affected dwellings up to a week at a time and monitoring through the night on countless occasions, my experiences do not allow me to accept the guidance at face value. At some future stage, there will be questions into the process that allowed a disproportionate level of noise impact in rural areas.

“My own work has shown repeatedly that the interpretations of Etsu commonly applied are in the majority of cases incapable of reflecting the true impact on communities from modern wind farms. The whole exercise gives an appearance of detailed investigation and analysis aimed at protecting communities but in reality is random or chance whether it achieves that end.

“Proportionately, wind farms appear to cause substantially more complaints than any other industry. To place this in perspective Etsu allows between 12-25dB more noise than commonly permitted for other industry.

“The heavily industry-dominated working group appears to have ignored incontrovertible research on wind shear without reason and adopted an approach shown to allow more noise. No reasoning based on science is given.

“There is now clear evidence a large number of wind farms cause noise complaints (more than 70), mainly due to amplitude modulation (AM) and characteristics in the noise, but this is also ignored with a response that ‘current practice is not to apply conditions to control this’.

“Arbitrary distances for microphone placement are adopted. The draft stated 3.5-10m but the final version applied 3.5-20m. Why these values and where is the research supporting them? Our research and all the

evidence clearly shows that as a general rule the closer you measure to a dwelling building (up to 3.5m) the lower the decibel values. There is good science why this is the case but it is ignored.

“There are serious weaknesses in Etsu such as the use of a formula for energy summation used to calculate changes in statistical values which, in fairness to the authors of Etsu, it warns about. The best practice guide simply adopts this formula despite it seriously skewing results leading to an understatement of the wind farm noise. This formula can readily change a breach of a limit into compliance but it cannot act in the reverse way. It weights the outcome in favour of the wind farm.

“There is a lack of guidance on one of the most important aspects of Etsu – post installation compliance checking. Why is this not explored in detail? We are increasingly cataloguing the disparity between what is said at the decision stage and the final outcome.”

Stigwood concluded: “We also see a failure by many industry acousticians to identify an impact when monitoring as they only measure for Etsu compliance. Unless you visit in the middle of the night under appropriate meteorological conditions and use appropriate microphones and instrument settings you will continue to fail to record amplitude modulation impact.”

If Stigwood is the consultant who is the thorn in the side of the wind industry, **Lee Moroney** and the Renewable Energy Foundation are its nemesis.

She tried to justify her belief that the guidelines increase allowable noise – and why she wants IoA to produce its evidence and data to justify its stance: “The big beef I have with the guidance is the effective increase in the Etsu-permitted noise levels at times of higher wind shear.

“The guide, and the authors of the *Acoustics Bulletin* method that the guide has now endorsed, has introduced a new methodology for setting noise condition limits that is insanely complex and has been accepted because most people (including, I strongly suspect, some of the authors themselves) don’t understand the ramifications of it.

“Etsu limits are being breached when measured 10m wind speeds are low but hub height wind speeds are high because of increased wind shear. The ‘solution’ devised by the UK wind acousticians is to change the noise condition so the limits no longer depend on the actual 10m wind speed, but instead depend on the ‘standardised’ 10m wind speed which is higher at higher wind shear. So whereas a 5m/s measured 10m wind speed might attract a 35dB noise limit under ETSU, it would attract a higher limit under the new regime at times of higher wind shear.

“By way of example, it is easily shown that at a site like Shipdham, shear higher than used in the IoA methodology occurs more than 90% of evening and night time hours. I am not saying this means that 90% of the time the effective limit will be increased by a significant amount but I am saying a significant percentage of the time it will be.”

She has reworked data from a real wind farm and at ten minute intervals compared ‘standardised’ 10m wind speeds with measured 10m high wind speeds. Measured wind speed in late afternoon was considerably less than the standardised wind speeds which would be used to set the noise limit. This means that the actual noise is 8dB more than what Etsu intended.



Best practice guide (continued)

Guide launched at stormy Bristol event

IoA president Bridget Shield opened the wind turbine best practice guide launch conference and got straight to the point: “We know a lot of people are not happy at Etsu, however the good practice guide’s remit was not to challenge limits or Etsu itself.”

Richard Perkins of Parsons Brinckerhoff was chairman of the working party that put together the guide. He followed Shield: “Wind turbine noise assessment has been much debated for many years and guidance is not clear, leading to much uncertainty in the planning process. Etsu has evolved over time and we are trying to capture the latest best practice – but it is important to stress that this is a technical supplement – we are not replacing Etsu.”

Perkins insisted that IoA is preserving its impartiality by retaining control of the document: “Government had no influence or editorial say in the content of the document – there has been no political interference with the technical document.”

Despite being clearly excluded from the terms of reference, some (including IoA members) still believe the potential health effects and the noise limits should have been included in the study. These feelings will be brought before IoA council and a high level summary of those feelings will

be forwarded to Government.

Perkins believes the working group has achieved what it set out to do – albeit the guide is still quite complicated for a general audience. It has been endorsed by English Government: “Ed Davey, minister at Decc, has written to us endorsing the guide as good practice. The guide therefore has credibility and weight so can be considered as a supplement to Etsu.”

Is the apparent indirect endorsement of Etsu by IoA likely to blow back in its face? Bridget Shield defended its position: “Before we decided to do this we had a long debate at council as we knew that a lot of members were not happy with Etsu limits. We felt it was to the benefit of members to produce a guide to ensure that Etsu was being applied properly.”

Still to come... the supplements

The devil may be in the detail!

A number of supplementary guidance notes are referenced in the best practice guide, but have yet to be written. They are being worked on in the coming months and cover some areas which are tricky and may cause further arguments:

- Data collection: Equipment specifications; measurement surveys: Practical considerations and set-up guidance and examples;
- Data processing and derivation of Etsu background curves: Data filtering, processing and regression analysis for different types of noise environments;
- Sound power level data of wind turbines: Manufacturer’s data and warranties analysis;
- Wind shear: Wind speed references and long-term data analysis;
- Post completion measurements: Examples, considerations and strategies;
- Offshore wind: Noise propagation over large bodies of water.

should indeed take a position on Etsu limits.

Dani Fiumicelli added his concerns on the politics: “I am somewhat concerned that it is Decc rather than Defra that is in charge of noise standards for wind turbines. And I am surprised that neither of them have chosen to be here today.” He welcomed endorsement of the guide by Government but posed the question as to what would happen when the guide’s addendum on amplitude modulation came out: “What happens if that is not endorsed by Government?”

He continued: “For an area with a background of 30dBA, Etsu allows 43dBA. Make no mistake that is a big change – albeit from very quiet to quiet. I think we should be commenting on what that means for residents and stop trying to pretend that there are no disbenefits. For an individual facing a wind farm application, it is very hard to get information on this.”

Speakers then explained their reasoning for various topics within the guide.

Background measurement is critical because of the way Etsu derives permissive turbine limits based on background plus an increment. The higher the background, the higher the allowable turbine noise limit.

At a public inquiry, measurement of background can take up a disproportionate amount of time with residents saying that background noise surveys are inadequate. The good practice guide attempts to standardise background noise measurements, giving advice on where monitoring should take place and for how long.

Class one equipment should be used (a controversial recommendation given cost) and corrections should be applied for confounders such as wind direction, rain, flowing water and atypical sound sources (eg heat pumps and boilers).

Wind screens for monitors need careful

At the Bristol conference there followed a discussion as to whether IoA should take an explicit position on Etsu limits. The initial response was that the IoA couldn’t take up a position without the backing of sound science.

But Gavin Irvine of Ion Acoustics pointed out that the IoA had robustly lobbied for BB93 school building standards on noise. “Given the lobbying on BB93, I don’t see why we shouldn’t also lobby on Etsu. Etsu’s endorsement of higher noise limits at night is ridiculous, I don’t see why council can’t argue for lower limits. It is disappointing that the guidance contains a phrase implying that limits shouldn’t be lowered.”

A vote was taken among the audience – and a show of hands suggested that IoA

Who put together the guidance?

Five people were on the good practice working group – and a further nine were on a peer review group.

The make up of the group has been commented on as being skewed towards the wind industry and that warrants further analysis.

Of the 14, six are self evidently pro-wind – they essentially are the wind industry, or are directly or indirectly employed by the wind industry. The rest are (arguably) independent although many have made it clear they are not particularly sympathetic to wind-sceptics.

There are no badge-carrying anti-wind interests represented – and yet the pro-wind lobby group Renewable UK is on the peer review panel.

This is why the anti wind lobby feel the good practice guide process has not been independent and has led to claims that the Institute of Acoustics has not acted impartially in the process.

Working party members:

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

Peer review group:

- Jeremy Bass (Renewable Energy Systems Ltd);
- Dani Fiumicelli (Temple Group);
- Gavin Irvine (ION Acoustics);
- Eoin King (Infrasonic);
- Toby Lewis (Huntingdonshire County Council);
- James Mackay (TNEI Services);
- Rod McGovern (Farm Energy Consulting);

Arguments for requiring Class 1 monitors

Why expensive Class 1 meters are specified: "It is the opinion of the group that the use of a sound level meter and microphone system complying with type 1 of BS EN 60651 or class 1 of BS EN 61672-1 is appropriate for the measurements which form the basis of the evaluation of ETSU-R-97 noise limits, and is preferable to type 2/class 2 equipment, as this will reduce uncertainties.

It is recognised that when such systems are fitted with larger windshield systems, which are required in most cases to provide meaningful results in an ETSU-R-97 assessment, then the effect of such windshield systems may result in technical non-compliance with the type 1 or class 1 requirements at some frequencies.

The use of type 1/class 1 instruments in combination with such windshield systems is nevertheless the preferred approach, rather than adopting type 2 or class 2 instruments in combination with such windshield systems, therefore small deviations from the type 1 or class 1 specification are to be allowed for the benefit of using such windshield systems.

thought and an addendum will be prepared to specify best practice here. Bob Davis told the conference: "Enhanced windscreens show significantly better wind noise reductions although may result in a 1dB reduction in measured sound – although this is in the resident's favour. Not all windscreens meet our requirements and we will provide supplementary guidance on this."

Wind speed measurement taken at the proposed turbine site needs to be gathered and matched with noise recorded at the resident's property. Wind recordings at hub height are preferred – standardised to 10m height. Remote measurement (eg Lidar) is permissible as is a shorter met mast with at least two height readings.

Correction for **wind shear** is complicated and controversial and was introduced by Malcolm Hayes – the most public face of the pro-wind consultant pack. He explained that Etsu assumed neutral (ie uniform) wind conditions, ie. that wind at ground level was

yield the expected noise and hence separation distances.

Mathew Cand of Hoare Lea warned of the difficulties of establishing **turbine noise characteristics**. Developers need to go to planning authorities with turbines – or candidate turbines – with rated noise levels. However it is not as simple as may be imagined getting a noise rating for a wind turbine.

Cand explained that manufacturers can provide 'noise test' results – sound power is provided, hopefully with uncertainty bands. The manufacturer may *warrant* that sound power by adding up to a 2dBA safety margin. But given the risk involved in this, they may refuse.

Then a turbine may come with a 'specification' – with or without a margin – or yet another definition may be 'declared values'. Cand said: "It can be seen that there is lots of different data for sound power. In the absence of clear information on uncertainty or warranties then it is best

the same as wind at hub height. This doesn't really matter for fixed speed turbines but does for more modern variable speed turbines where noise varies more with blade speed (15dBA as opposed to 3dBA for a fixed speed turbine).

The solution is to standardise measurements to a 10m height – background noise, wind, shear and turbine ratings can then be matched using correction factors. In this way a curve can be derived which will

to add 2dB."

Cand then listed recommendations for adjusting noise attenuation – for instance adding for hard surfaces such as water and subtracting for terrain screening.

Chris Jordan of the Northern Ireland local authority consortium Northern Group Systems talked about **cumulative impact**. He noted he had some 300 applications in at the moment, the vast majority would involve cumulative impact,

He explained that Etsu provides absolute noise limits and margins above background: "Problems have emerged because of the legacy of wind farms which operate right up to their Etsu limits. Etsu stipulates absolute noise limits and margins above background and so there may be no headroom for new proposed wind farms."

There is also the issue of determining background noise with an existing wind farm in operation. It would cost a lot to turn off that wind farm – even assuming the competitor company would choose to cooperate. Jordan suggests work-arounds such as using previous background noise data or using a proxy location.

Dani Fiumicelli of Temple was left to pose the question as to whether the aims of the working party had been met. Amidst all the acrimony over Etsu, he pointed out: "Etsu is policy, not choice. There is a huge weight of evidence to show that we must use Etsu whether we like it or not. Noise limits are a political decision, I can't think of any noise limits where this isn't the case."

He noted the findings of the Decc report on the consistency of wind turbine assessments (*Noise Bulletin July 2011 p1*): "Some of the shortcomings identified in the Decc report are embarrassing to the acoustics profession. This good practice guide acts as a 'line in the sand' for the profession and gives us a minimum standard.

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Etsu limits and WHO guidelines: not to be compared

The thorny issue of Etsu limits was covered in the best practice guidelines draft but didn't make it to the final version.

It is worth repeating what was said in that draft as it the disparity between what Etsu allows and what WHO 'allows' is much discussed. And bear in mind that WHO guidelines are often misused – they are guidelines, not statutory limits, and are aspirations for a perfect world rather than limits in the real world.

Here's how the draft best practice guide explained it: "Since the issue of the *WHO guidelines for community noise*, further work has been undertaken by the WHO and which has now been published by the WHO (*Night Noise Guidelines (NNGL) for Europe*) (*Noise Bulletin November 2009 p1*).

"This document concludes that observable effects start to occur when $L_{\text{night, outside}}$ levels exceed 40 dB. The $L_{\text{night, outside}}$ level is defined as the one year LA_{eq} over eight hours outside the most exposed façade. This is a level at which increased levels of body movement may be related to noise exposure. However, this does not indicate the potential awakening of the sleeping occupant. To determine this level for an operating

wind farm requires knowledge of the yearly average wind speeds and wind directions, both of which will affect the received noise level at the receptor location. As the noise emissions from the wind turbines are related to the wind speed, then periods of low wind speed will result in lower noise levels as compared to conditions of higher wind speeds.

"Therefore, to determine the yearly LA_{eq} during the eight hours of night-time would require knowledge of the distribution of the wind speeds and wind directions for the average year. In any case, it would be wholly misleading to compare the worst case calculated wind farm noise immission levels (generally under downwind conditions) with the criteria set out in the new *Night Time Noise Guidelines* which are based on annual average levels.

"The night noise guidelines have not been adopted by any European Government. It is also noteworthy in that they are neither standards nor legally binding criteria, but instead are designed to offer guidance. In terms of their immediate application, it is also worth noting the setting of an intermediate target of 55dB."

Best practice guide (continued)

Key wording from the best practice guide

The 40 page best practice guide is intended to be useful to everyone from consultants and local authorities down to those affected by wind farms. However it is accepted that it gets rather technical for the general public.

Best practice is suggested for all the different stages of Etsu assessment – the stages are:

- Predict noise levels from all turbines (existing and proposed) at the nearest receptors;
- Determine the study area;
- Identify potentially affected properties;
- (If required) Undertake a measurement survey consisting of simultaneous measurement of background noise levels at representative properties with wind speed and direction at the proposed turbine site;
- Analyse the data to remove rain-affected and atypical data, and derive the noise limits for the scheme;
- Update noise predictions and assess compliance with the noise limits for a candidate turbine, and provide design advice if compliance with the limits is considered unlikely.

Using this procedure, wind farm developers should be able to say how much noise their farm will make and how this compares to background. Decision makers can then decide whether this complies with Etsu – which is official policy – and thus acceptable.

Acceptable in policy and legal terms is different to whether it is acceptable to residents – an argument repeatedly made is that all projects should be subject to an environmental impact assessment to outline the *impact* of a development – eg the extra noise. Etsu does not put a cap on this increase in noise so a wind farm could add a lot of noise in an area with low background levels.

With that in mind the preface notes: “This good practice guide has been approved by the Institute of Acoustics Council for use in the assessment and rating of wind turbine noise using Etsu. It covers technical matters of an acoustic nature which the IoA-noise working group believes represent current

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BRISTOL LAUNCH CONFERENCE (continued from previous page)

“Sometimes we as consultants are under serious pressure *not* to do robust assessments on the grounds of cost. I think the good practice guide gives us the opportunity to push back against that pressure and do work we can be proud of.

“However amplitude modulation is the elephant in the room. It is the one area where the good practice guide hasn’t moved forward on best practice and to put it politely we are very disappointed at this. We have had an update from Renewable UK today but we are still no better informed and are still waiting for the release of the report. It leads the conspiracy theorists to conclude that there is something to hide.”

Lee Moroney of Renewable Energy Foundation questioned the speakers from the floor putting forward views of wind farm protesters. “The most contentious part of this is the endorsement of Etsu. Given the remit not to discuss limits, this appears to be a back door way of allowing more noise.” Bob Davies countered: “We are suggesting monitoring periods over two to four weeks. You may be right in that you could in theory end up with a worsening but we think the likelihood is extremely small. Moroney said she felt that the onus was on the IoA to release data so this could be tested.

She reiterated that she believed that the guide would increase the amount of headroom that windfarms can make during periods of high wind shear. Richard Perkins disputed that: “I don’t believe what we are proposing is more permissive. What we are doing is formalising what should have been done in the first place.”

Graham Parry of Accon-UK came to the defence of the guide saying: “It is important to understand that the methodologies being proposed here are far more rigorous than the hundreds of BS4142 assessments being

done every week. Those may rely on data from a just a single day and don’t look at uncertainty.”

Consultant Graham Rock warned: “Don’t confuse ‘standardised’ with rigour. If we are talking about just a few data points of wind measurements, I don’t call that rigour.”

Dani Fiumicelli of Temple Consultants said he felt that the UK regime for wind turbine noise assessment was among the toughest 25% across the countries he had studied: “A large proportion of the world has significantly less stringent conditions. In the US you can get people living in tin cans just a few hundred metres from turbines and unsurprisingly you get negative reactions.”

Gavin Irvine of Ion Acoustics added: “I’m disappointed that the good practice guide is not pointing out there is a requirement to do environmental impact assessments – there is an overriding duty to assess impacts properly.”

Richard Perkins listed some of the topics which were left out of the process – one of which was a model planning condition: “We wanted to give more advice on this – Etsu has one so why shouldn’t we? But the advice we received was that we shouldn’t without taking potentially expensive legal advice. The budget for this work was extremely tight, and instead a sample planning condition is included.”

Amplitude modulation was also left out: “When we did our risk register at the beginning of the process, this was top of our list. 18 months down the line we are still saying the same thing. Hopefully in one or two years time we will have definitive good practice. In the meantime, is falling back on statutory nuisance a satisfactory solution? Experience has told us that it isn’t.”

On uncertainty, the consultation threw up

some criticism that this had been omitted: “Just because there isn’t a whole section on uncertainty does not mean that it hasn’t been taken into account. If uncertainties are not correctly applied as per the good practice guide, the scheme runs the risk of breaching the noise condition and being shut down. And if that happens, consultants may well find they have breached their professional indemnity cover!” said Perkins.

Low frequency and infrasound is not included – the working group does not believe it is a problem.

Marcus Trinnick –retained by Renewable UK and the industry’s first choice of advocate to argue for wind turbines at public inquiries – reported progress on RUK’s all-important research into amplitude modulation. This didn’t take long as there didn’t appear to be any progress.

The RUK research project was first announced in 2011 and results were supposed to be an integral part of the good practice guide. Amplitude modulation – thumping – is behind the majority of noise concerns of modern large turbines but there is no consensus on how it can be controlled by conditions.

RUK had originally hoped to finish the work “within seven months” and at last year’s wind energy conference expected it to be ready soon. At this conference Trinnick delivered a similar message – that he was unable to give a firm date.

“RUK is very aware that ‘other’ amplitude modulation is an intractable subject and we have spent over £100,000 researching it. We can’t give you a publication date but we will share the findings with you. We do want to get the job out of the way but it won’t end the debates that take place at public inquiries – but it will make things easier with Etsu, whatever you think about it.”

good practice. The approval of this guide by the IoA Council should not be seen as an endorsement of the noise limits within the Etsu document since the setting of these noise limits is a policy matter for Government.”

Here are some of the key points of the best practice guide:

● **Turbine size:** The guide explains that it is for big turbines: “This guide presents current good practice in the application of the ETSU-R-97 assessment methodology for all wind turbine developments above 50 kW, reflecting the original principles within Etsu, and the results of research carried out and experience gained since Etsu was published. The noise limits in Etsu have not been examined as these are a matter for Government.

Smaller developments such as single turbines warrant a simplified procedure (either based on Etsu or other method agreed with the local planning authority), commensurate with the size and impact of the project. Local planning policies should also be checked for any variations to methodologies or limits – an increasing number of authorities are trying to control turbines through planning policies with varying degrees of success (for example Milton Keynes, *Noise Bulletin May p6*);

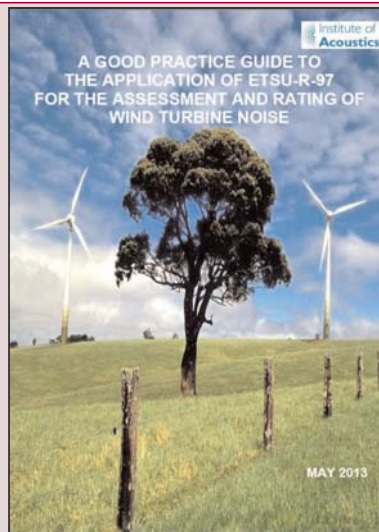
● **Liaison and engagement:** Engagement of all of the relevant parties from an early stage and throughout the project is desirable. This includes from site scoping to the drafting of planning conditions. The guide says: “A significant aspect of the consultation should be whether surveys are required, and if they are, agreement on the number and position of background noise level measurement locations should be sought. Such agreement will benefit all parties, as background noise level measurements can be an area of considerable debate, and targeting resources at this early stage in the development process should provide dividends in the future by reducing the likelihood of protracted arguments and potentially the need for additional background noise level measurements.”;

● **Study area:** The ‘study area’ for background noise surveys (and noise assessment) should, as a minimum, be the area within which noise levels from the proposed, consented and existing wind turbines may exceed 35 dB LA₉₀ at up to 10 m/s wind speed;

● **Cumulative impacts:** “Any contribution to background noise levels of noise from an existing wind farm must be excluded when assigning background noise and setting noise limits for a new development.” (*Editor’s comment: This policy is at odds with usual planning policy – there have been a number of high profile planning appeal decisions testing the principle that noise from a properly consented development (eg. a motorsport track) can change the character of the area and the noise from the usage can be considered as background – not discounted*);

● **Numbers and positions of measurements:** The background noise monitoring locations within the study area should be selected on the basis of professional judgment, with the objective of collecting sufficient data to enable the background noise levels at each noise-sensitive receptor within the study area to be characterised. Choosing a representative location can be tricky and is likely to be disputed: “Where possible, measurements should be made in the vicinity of a dwelling in an area frequently used for rest and recreation. This is a flexible definition, and the way people use their garden areas varies widely. Identifying the most appropriate measurement positions must be a matter of professional judgment and experience.

“The overriding consideration is that it can reasonably be



claimed, from inspection and observation, that there are no other suitable noise-sensitive locations, in the vicinity of any selected location and close to a dwelling, where background noise levels would be expected to be consistently lower than the levels at the selected position.

Noise measurement equipment and calibrators used on site should comply with Class 1/Type 1 of the relevant standard(s). Enhanced microphone windscreens should be used. Standard windshields of a diameter of less than 100 mm cannot be relied upon to provide sufficient reduction of wind noise in most circumstances (see *box previous page*);

● **Wind speed measurement:** Wind shear – the stratification of wind speed with height – has become the main battleground for experts at public inquiries.

The best practice guide suggests

background noise measurements should be correlated with values of standardised 10 metre wind speed, calculated from hub height wind speed. Hub height wind speed is either measured directly or calculated from measurements made at two heights with the higher measurement height being no lower than 60% of hub height. If 10 metre mast data is used, corrections must be made to allow for wind shear characteristics

Whether corrections properly account for the high wind speeds (and therefore noise outputs of turbines) is much disputed and the guide is unlikely to stop such arguments;

● **Synchronisation of noise, wind and rainfall measurements:** Measurement intervals for wind speed, measured noise levels and to a lesser extent rainfall should be synchronised to within at most one minute over the survey period. Rain is an important confounder because wet surfaces transmit noise better, and running water sources can become louder;

● **Durations of surveys:** The duration of a background noise survey is determined only by the need to acquire sufficient valid data over the range of wind speeds (and directions, if relevant). It is unlikely that this requirement can be met in less than two weeks. “As a guideline, no fewer than 200 valid data points should be recorded in each of the amenity hours and night time periods, with no fewer than five valid data points in any 1m/s wind speed bin. In specific cases where background noise levels are dependent on wind direction and data is to be ‘filtered’ into two or more datasets then a minimum of 100 valid data points and three valid data points per 1m/s bin in each data set may be adequate.”

Modern turbines reach maximum noise output at around 8m/s windspeed reducing the importance of having to extend the survey to catch periods of higher wind speeds;

● **Amenity hours:** The guide defines amenity hours – the period at which residents can be expected to want to relax and enjoy their garden: “Amenity hours are defined as 18:00 – 23:00 hrs Monday – Sunday, 13:00 – 18:00 Saturday and 07.00 to 18.00 Sunday. When people are in their bedrooms (11pm till 7am) Etsu allows extra noise – this feature of Etsu leading to much dispute.

● *A good practice guide to the application of ETSU-R-97 for the assessment and rating of wind turbine noise can be downloaded from www.ioa.org.uk/pdf/ioa-gpg-on-wtna-issue-01-05-2013.pdf*

Consultation responses to the earlier draft guidelines (300 + pages) can be viewed on www.ioa.org.uk/pdf/consultation-responses-part1.pdf

The launch of the IoA good practice guide was much anticipated – the IoA knew it was going to be controversial and attract the critical eye of objectors.

To its credit, it let them in to the event – the IoA of old may well have considered them annoying, but IoA of late has been taking a responsible policy-focused line and understands that if it is going to get involved in things that affect the public in such a high profile way, then it needs to hear what the public are saying.

So the terrier-like Lee Moroney of the Renewable Energy Foundation was there – and for the absence of doubt, don't be fooled by the title, Moroney does not like turbines and has the intellectual firepower to put up a good fight. She was quick to demand time for questions – "give us the data" was her clarion call.

Noise Bulletin sits at the back of these conferences so we can keep an eye on the audience as well as the speakers. From the back you can see whether concepts are being welcomed with disbelief or incredulity, or even subtleties, like the stiffening of shoulder blades amongst the audience.

But there was no subtlety about the

reaction of Moroney to Mathew Cand of the Hoare Lea – a firm that very much nails its colours to the mast in favour of wind power. Or indeed vice-versa.

If Moroney gave chairman Richard Perkins firm questioning the gloves came off with Cand – there's no hiding the animosity between the two and it felt like we were watching a messy divorce hearing!

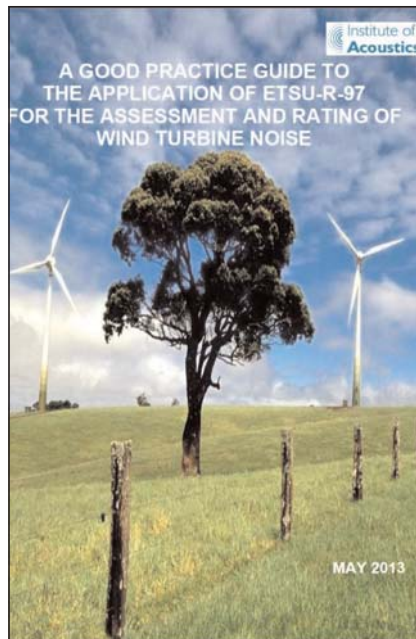
The good practice guide set out to solve the arguments between both sides. Perhaps this is an early omen that it will do no such thing.

The Government seems desperate to get more householders to install 'green' heating.

This includes heat pumps, which are prone to shaking themselves to bits after a few years and causing enough noise to wake up neighbours.

Among the various eligibility requirements, energy minister Greg Barker said that grants would be limited to 'hardworking people'. So presumably those on benefits need not apply?

What about MPs and teachers – they have long holidays – need they apply? Retired? Presumably forget it.



Distorted reality? A tree apparently towers over 130m tall turbines on the cover of the IoA good practice guide. Was this by accident or design?

NOISE EVENTS 2013

2nd-7th June

ICA 2013

International Congress on Acoustics and a meeting of the Acoustical Society of America to be held in Montreal www.ica2013montreal.org

20th June

RAILWAY NOISE – WHAT EVERY ACOUSTICIAN SHOULD KNOW

Southern Branch IoA meeting to be held at the Guildhall, Winchester, website www.ioa.org.uk

25th June

STATUTORY NUISANCE LAW AND ENFORCEMENT

CIEH conference to be held in Birmingham, www.cieh.org/events

26th June

LARGE WIND TURBINE NOISE – A CASE STUDY

North Western Branch IoA meeting to be held in Manchester, website www.ioa.org.uk

3rd July

WIND TURBINE NOISE: A BRIEF HISTORY & SOME TECHNICAL ISSUES

Central Branch IoA meeting to be held at NHBC Milton Keynes, website www.ioa.org.uk

11th July

THE ISVR AT 50: MAKING A WORLD OF DIFFERENCE

Symposium to be held in Southampton to celebrate the 50th anniversary of the Institute of Sound and Vibration Research (ISVR). www.isvr50.soton.ac.uk

26th – 28th August 2013

NOISE-CON 2013

to be held in Denver www.inceusa.org/nc13

28th – 30th August 2013

2013 INTERNATIONAL WIND TURBINE NOISE CONFERENCE

to be held in Denver www.inceusa.org/nc13

11th September

STATUTORY NUISANCE AND RESIDENTIAL PROPERTY

CIEH conference to be held in London, www.cieh.org/events

15th-18th September

INTERNOISE 2013

the 42nd International Congress and Exposition on Noise Control Engineering to be held in Innsbruck. <http://internoise2013.com>

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NEWS ABOUT CLB



NB's sister magazine *Contaminated Land Bulletin* is now published by Environment Analyst Ltd.

Noise & Air Bulletins are unaffected by this change and CLB readers are unlikely to notice the difference for now – however *Environment Analyst* has the online strength to take the magazine forward in what are difficult times for the development industry. The handover will be gradual and we intend to retain close links and cooperation.

Jack Pease