new acoustics

34 Old Mill Road
Duntocher
Clydebank
Dunbartonshire
G81 6BX
Scotland

Tel (013) 8987 8891
Fax (013) 8989 0516

email mail@newacoustics.co.uk
web site www.newacoustics.co.uk

MELLOCK HILL WIND FARM

ENVIRONMENTAL STATEMENT

Comments on Noise Section

Dick Bowdler
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ENVIRONMENTAL STATEMENT

Comments on Noise Section

SUMMARY

1 The purpose of this report is to review the Noise Section of the Environmental Statement for the proposed windfarm at Mellock Hill and to provide an opinion as to the impact of the windfarm on local residents.

2 The method of assessment used by the applicant, which I will call the ETSU method, is commonly used to assess windfarm noise and is incorporated into Planning Advice Note, PAN45 Renewable Energy Technologies. However, it is not a method of assessing the impact of noise on neighbours but a framework for achieving a balance between a reasonable degree of protection to neighbours and reasonable restrictions on developers. In addition to commenting on the ETSU assessment, I have assessed the impact of turbine noise on neighbours.

3 The Executive Summary is clear and precise and the text of the noise section sets out clearly the methodology and assumptions made. However, at three of the six background noise locations, there are serious faults with the background noise data to the extent that they are not usable. At a fourth location, the data is also suspect.

4 I have no significant disagreement with the stated method of calculation of turbine noise nor with the results.

5 Because of the problems with background noise data I have re-calculated compliance with the ETSU method. Golland, Craighead Farm and Earnieside all meet the special standard ETSU has for beneficial properties. All the other properties meet the night time standard. Braughty Farm, Myrehaugh and the cottage at Earnieside meet the ETSU upper guideline of 40dB. All other properties meet the ETSU lower guideline of 35dB.

6 Although the proposed wind farm passes the applicant's own noise test set out in ETSU, this only happens because the upper absolute limit of 40dBA is taken as a standard.

7 I have assessed the likely loss of amenity at surrounding properties. With the exception of beneficial properties there are 2 properties that will suffer a major loss of amenity and one property that will suffer a significant loss of amenity. 6 properties will suffer a marginal loss of amenity.

8 I am not aware that this is an area used significantly for walking or other recreation.

9 Should the proposal be granted planning permission I recommend that there should be conditions attached that limit noise levels at surrounding properties.

10 If planning permission is granted for this and other windfarms nearby there may be a cumulative effect on some residents. I will deal with this separately in another paper.

1 INTRODUCTION

This report is prepared on the instructions of Perth and Kinross Council. The purpose is to examine and comment on the Noise Section (Chapter 11 and Appendix 11) of the Environmental Statement for the proposed windfarm at Mellock Hill and to provide an opinion as to the impact of the windfarm on local residents. References to the Environmental Statement refer only to the noise section.

I have not been asked to comment on construction noise.

2 METHODS OF ASSESSMENT

The method of assessment used by the applicant is set out in *The Assessment and Rating of Noise from Windfarms* (ETSU-R-97). This is commonly used to assess windfarm noise and is incorporated into PAN45 *Renewable Energy Technologies*. However, it is not a method of assessing the impact of noise on neighbours. This is not merely a personal view but is clearly stated in the first paragraph of the Executive Summary of ETSU-R-97 where it explains that the report *describes a framework for the measurement of wind farm noise and gives indicative noise levels thought to offer a reasonable degree of protection to wind farm neighbours, without placing unreasonable restrictions on wind farm development or adding unduly to the costs and administrative burdens on wind farm developers or local authorities*. Section 3 of this report contains my comments on the Environmental Statement in terms of ETSU-R-97.

The most commonly used method of assessment of the impact of a new noise is by comparing the new noise with the pre-existing background noise by the method set out in British Standard 4142. At low noise levels there is some controversy about using this method but, for all its faults, BS4142 has been around for nearly 30 years and is widely used in rural Scotland even for low background levels. The Appendix sets out the issues in more detail.

Since the Environmental Statement does not clearly set out the noise impacts on neighbouring properties I have used BS4142 to do this in Section 4.

3 ETSU-R-97 ASSESSMENT

This is the method used in the Environmental Statement. The ETSU method compares the predicted noise from turbines with the background noise or, where background noise is low, with a fixed noise level. This requires that measurements of background noise are made, turbine noise levels are calculated, and a comparison is made of the two.

All noise levels in this section are shown as L_{A90} unless otherwise stated, in accordance with ETSU-R-97.

3.1 General Comments

11.1 Executive Summary is clear and precise.

All the methodology and assumptions are clearly set out.

11.3.8 says that *the thresholds are therefore used in the assessment to identify whether significant impacts will occur*. It is not the case that they are a measure of impact as I have pointed out above. Readers should not be misled into thinking that compliance with the ETSU guidelines means that there will be no significant impact.

3.2 Background Noise

Background noise measurements have been made at six positions near to neighbouring residential properties (not nine as implied in Figure 11.1).

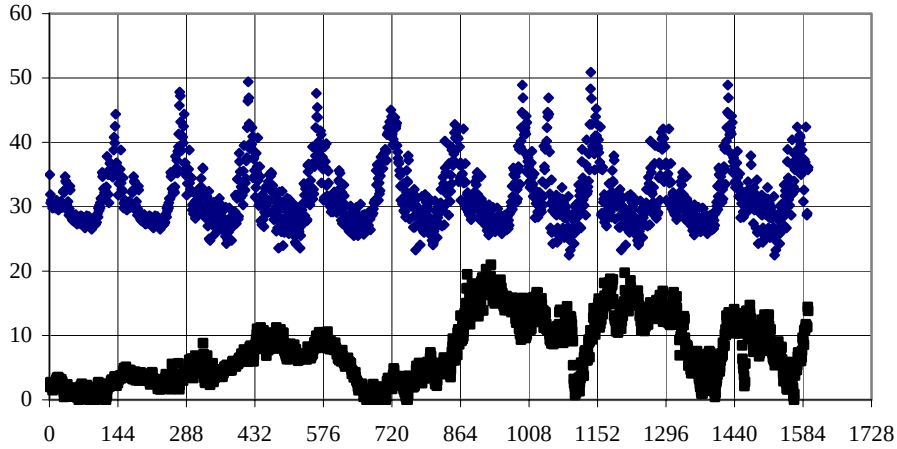
In principle this is a sufficient number of measurements and there is a reasonable spread of wind speeds and directions during the measurement period.

However, there are anomalies of some concern in the background noise measurements.

3.2.1 Earnieside

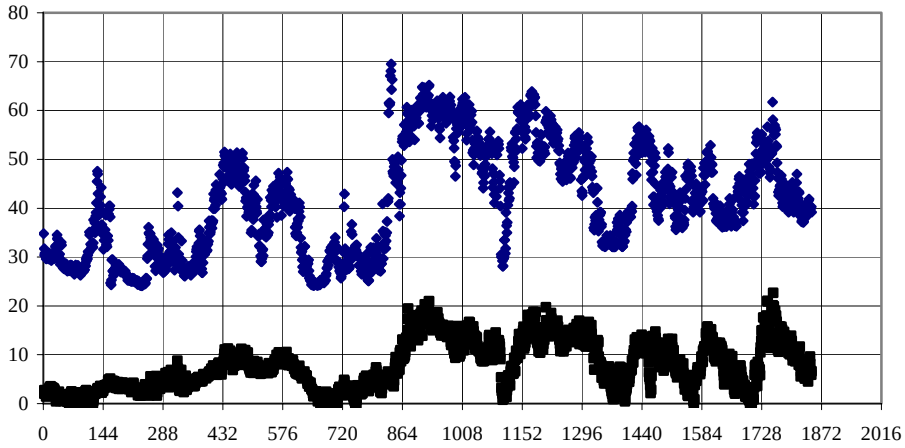
At Earnieside the dominant feature is a diurnal variation that peaks strongly on most days at ten minutes past ten in the morning.

In the graph below the figures along the bottom are the 10 minute time periods and the vertical lines represent 24 hours. The top set of data is noise level in decibels and the bottom set is wind speed in metres per second.



It may be that this is a true picture of day time noise but the night time noise shows no correlation with wind. The noise level in the middle of the night stays resolutely below 30dB even in winds of 20m/s. Gale force starts at 17.5m/s.

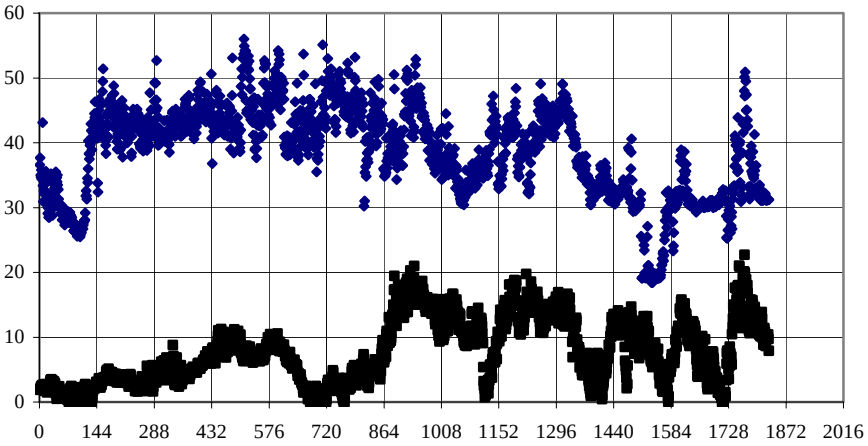
We can compare this with Coulsknowe, which shows a typical pattern of wind noise.



Here the noise level and wind speed follow the same pattern with the noise level rising and falling with wind speed.

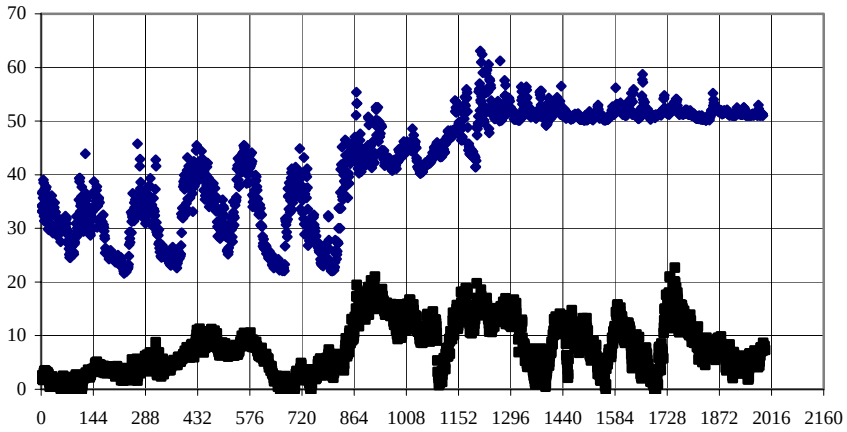
3.2.2 Golland

The measurements at Golland also show no correlation with wind speed (except perhaps on the last day) to the extent that they cannot be relied upon. For example, on the night of 18th and 19th March (between 1440 and 1584 on the graph), when wind speeds were in the order of 10m/s, noise levels of around 20dBA were recorded – much lower than at any other time during the measurement period. Yet for most of days 2 to 7 the noise level hardly dropped below 40dB, even when there was no wind.



3.2.3 Craighead

At Craighead, for the first six days there is a strong diurnal variation with very little correlation with wind speed even at night. For the next two days the noise level never drops below 40dB even when the wind speed drops almost to zero in the middle of the night. Thereafter the noise level stays fairly consistently just above 50dB with no correlation with wind speed even maintaining this level when wind speeds drop to zero.

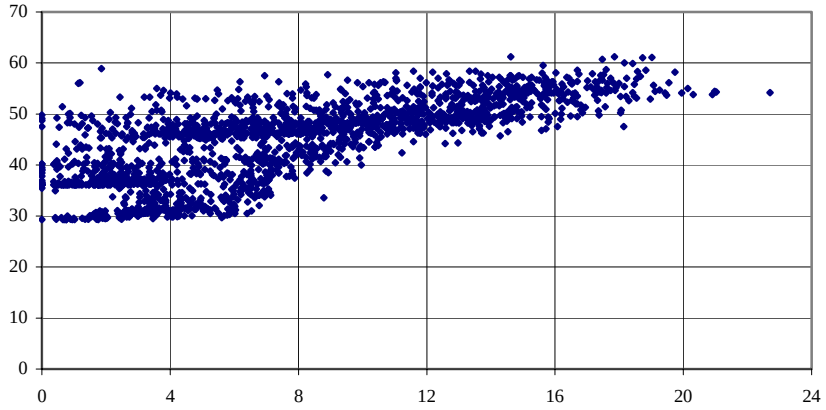


This seems to suggest that there are significant noise sources other than wind.

3.2.4 Greenhill

In the case of Greenhill much of the data seems to be reasonably satisfactory but there are some horizontal bands of data.

This time the graph shows noise level, on the vertical axis, plotted against wind speed on the horizontal axis. The bands can be seen between 0 and 4 m/s at about 30 and at about 36dB and at higher wind speeds at just under 50dB. These bands show there are other significant sources other than wind.



The band at 30dB is probably water noise and this is part of the natural environment. The band at around 36dB is partly made up of the data between 2000hrs on 8th and 0540 on 9th March when all the readings were exactly 36.1dBA. This is of concern because it suggests a meter fault near the beginning of the measurement period. Although it is not apparent at other times it does cast some doubt on the value of the remaining measurements. There is another band at about 47dB which may be due to non wind associated noise or possibly a further problem with the meter.

3.2.5 Coulsknowe and Littlerig.

The noise figures for Coulsknowe and Littlerig show excellent correlation with wind speed and are the classic form of graph. I have no reason to doubt their accuracy. Littlerig predictably shows the bottoming out around 30dB due to the burn between the road and the house.

3.3 Turbine Noise

I have no significant disagreement with the stated method of calculation of turbine noise nor with the results for turbine noise set out in Tables 11.6 and 11.7.

3.4 Proposed Turbine Noise Standards

The maximum permitted noise level of turbines is set out in paragraphs 21 and 22 of ETSU R-97. This permits levels of 5dBA above background noise except where background noise is low when there is an absolute limit of 35 to 40dBA during the day and 43dBA at night.

Section 11.3.7 proposes a day time limit of 40dBA on the grounds that there are only four properties within 1km of a turbine. The distance of 1km is purely arbitrary. If a greater distance had been chosen then more properties would be included. As the ES says in 11.3.6, ETSU gives no quantitative guidance on how the selection of the absolute limit should be decided so it is not possible to say whether it is appropriate. However, my view is that 40dBA should only be applied in exceptional circumstances and is not appropriate here.

3.5 Assessment

The assessment states that all properties meet the ETSU standard. I note that the last column of tables 11.6 and 11.7 state that the significance of the impact is “none”. This is not correct because ETSU-R-97 is not a measure of impact as I have explained in section 2.

The conclusion that all the properties meet the ETSU guidelines is in doubt because of the problems with the background noise measurements. I have looked at the position where most of the background noise levels are the default background noise levels set out in Guideline 6 of the Perth and Kinross Wind Energy Policy Guidelines. The exceptions are the two properties where I have no argument with the background noise measurements, Littlerig and Coulsknowe. I do not feel that the background noise measurements at these two locations can be extrapolated elsewhere because they are both almost within forestry. In addition Littlerig is affected by water noise. The result is as follows:

> Golland, Craighead Farm and Earnieside all meet the special standard ETSU-R-97 has for beneficial properties.
>
> All the other properties meet the night time standard.

Braughty Farm, Myrehaugh and the cottage at Earnieside meet the ETSU-R-97 upper guideline of 40dB. All other properties meet the ETSU-R-97 lower guideline of 35dB.

I also note that, with the exception of the cottage at Earnieside the Environmental Statement has addressed all the properties that have a turbine noise level at any wind speed of more than 35dBA so, with that one exception, in ETSU terms the assessment is complete.

On balance I consider that the proposed wind farm strictly passes the applicant's own noise test set out in ETSU-R-97, though I am concerned about the use of an absolute limit of 40dBA.

4 NOISE IMPACT ASSESSMENT

I have set out in this section my assessment of the likely loss of amenity to residents using the spirit of British Standard 4142.

Unless otherwise stated in this section, turbine noise is in L_{Aeq} and background in L_{A90} as provided for in BS4142. I have no evidence that there are any tonal components in windfarm noise and so the L_{Aeq} value is the same as the rating level described in BS4142. Wind speeds are those at 10m height.

As a rule of thumb I think that all properties within 2km of a turbine should be assessed. This is less than the minimum distance for these turbines in the Wind Energy Policy Guidelines produced by Perth and Kinross Council.

4.1 Background Noise

Local Authorities generally require that background noise is measured at the quietest part of the period in question. For example, where the background is dominated by road traffic this may fall to a minimum about 3am. The 3am level is generally considered to be representative of the background noise throughout the night: the average over the whole night period is not considered to be appropriate. In the case of windfarms the "period" required at each wind speed is the aggregate of all the periods at that wind speed and the background noise level at any wind speed should be the quietest at that wind speed.

The methodology used by ETSU is effectively to average 10 minute values of L_{A90} at each wind speed and this gives a higher figure than would normally be considered appropriate for an amenity assessment.

To overcome this problem it is my practice to take the 25th percentile or the mean less one standard deviation of a group of 10 minute measurements at a particular wind speed to define the L_{A90} at that wind speed.

I see no reason to differentiate between day and night since the turbine noise levels will be no different. In any case, in most rural areas there is only a small difference between background noise levels in the day and the night.

At locations where there are satisfactory background noise measurements I have used those figures. Specifically I have taken the average of the day and night noise levels at each wind speed and deducted 3dB, which typically gives the 25^{th} percentile. Elsewhere I

have taken the typical background noise levels incorporated into Perth and Kinross Wind Energy Policy Guidelines June 2004. The table below shows these background noise measurements.

Background Noise	Wind Speed									
	3	4	5	6	7	8	9	10	11	12
Knowhead	24	24	25	27	29	31	33	35	37	39
Ledlation	24	24	25	27	29	31	33	35	37	39
Wester Dalqueich	24	24	25	27	29	31	33	35	37	39
Golland*	24	24	25	27	29	31	33	35	37	39
Carnbo	24	24	25	27	29	31	33	35	37	39
Craighead Farm*	24	24	25	27	29	31	33	35	37	39
Easter Fossoway	24	24	25	27	29	31	33	35	37	39
Braughty Farm	24	24	25	27	29	31	33	35	37	39
Thorntonhill	24	24	25	27	29	31	33	35	37	39
Glendunning House	24	24	25	27	29	31	33	35	37	39
Myrehaugh	24	24	25	27	29	31	33	35	37	39
Coulsknowe	29	31	33	35	38	41	44	47	50	52
Earnieside*	24	24	25	27	29	31	33	35	37	39
Cottage at Earnieside	24	24	25	27	29	31	33	35	37	39
Littlerig	33	35	36	38	40	42	44	46	48	50
Corb	24	24	25	27	29	31	33	35	37	39
Greenhill	24	24	25	27	29	31	33	35	37	39
Greenhill Cottage	24	24	25	27	29	31	33	35	37	39
Blaeberry Toll	24	24	25	27	29	31	33	35	37	39

4.2 Turbine Noise at Neighbours

I have used the noise levels at the neighbouring properties as calculated by the CONCAWE method, which takes account of different meteorological conditions. The conditions taken are Category 6, which is favourable to downwind propagation. In practice the results from this method are usually within about 1dBA of those obtained using ISO 9613-2, which is the applicants model. In accordance with BS4142 the values are L_{Aeq} so the noise levels are typically 2dBA higher than the ETSU figures.

The table below shows the turbine noise levels at neighbouring properties.

Turbine Noise	Wind Speed									
	3	4	5	6	7	8	9	10	11	12
Knowhead	20	23	29	32	33	34	33	33	33	34
Ledlation	16	19	25	28	30	30	30	29	30	30
Wester Dalqueich	16	19	25	28	30	30	30	29	30	30
Golland*	21	24	29	33	34	35	34	34	34	35
Carnbo	17	20	26	29	30	31	30	30	30	31
Craighead Farm*	29	32	37	41	42	43	42	42	42	43
Easter Fossoway	19	22	27	31	32	33	32	32	32	33
Braughty Farm	27	30	35	39	40	41	40	39	40	40
Thorntonhill	15	18	24	27	28	29	28	28	29	29
Glendunning House	19	22	27	31	32	33	32	32	32	33
Myrehaugh	24	27	32	36	37	38	37	36	37	37
Coulsknowe	22	25	31	34	35	36	35	35	35	36
Earnieside*	27	30	35	39	40	41	40	40	40	41
Cottage at Earnieside	26	29	35	38	39	40	39	39	40	40
Littlerig	27	30	35	39	40	41	40	40	40	41
Corb	19	22	27	31	32	33	32	32	32	32
Greenhill	21	24	30	33	35	35	35	34	35	35
Greenhill Cottage	20	23	29	32	33	34	33	33	33	34
Blaeberry Toll	15	18	24	27	29	29	29	28	29	29

4.3 Assessment of Impact

BS4142 says that *A difference of around 10dB or higher indicates that complaints are likely. A difference of around 5 dB is of marginal significance.*

An increase in noise level of up to 3dB is not readily detectable.

Based on the principles above, I suggest an assessment of loss of amenity as shown below. This is included in Perth and Kinross Wind Energy Guidelines June 2004.

A difference of 3dB or less – insignificant
A difference of 4 to 6dB – marginal loss of amenity
A difference of 7 to 9dB – significant loss of amenity
A difference of 10dB or more – major loss of amenity

The old planning guidance (Circular 24/73) provided some justification for this in the case of industrial noise generally. It says (in common with the Welsh guidance quoted on page 21 of ETSU-R-97) that *where, by the standards established in BS4142, "the noise from the development is likely to give rise to complaints" it will hardly ever be right to give [planning] permission*. PAN 56 is less specific but says in relation to windfarms that *Good acoustical design and siting of turbines is essential to ensure there is no significant increase*

in ambient noise levels as they affect the environment and any nearby noise-sensitive property.

Taking the two tables above I have deducted the background noise level from the turbine noise level to obtain the values in the table below.

Difference	Wind Speed									
	3	4	5	6	7	8	9	10	11	12
Knowhead	-4	-1	4	5	4	3	0	-2	-4	-5
Ledlation	-8	-5	0	1	1	-1	-3	-6	-7	-9
Wester Dalqueich	-8	-5	0	1	1	-1	-3	-6	-7	-9
Golland*	-3	0	4	6	5	4	1	-1	-3	-5
Carnbo	-7	-4	0	2	1	0	-3	-5	-7	-8
Craighead Farm*	5	8	12	14	13	12	9	7	5	4
Easter Fossoway	-5	-2	2	4	3	2	-1	-3	-5	-7
Braughty Farm	2	5	10	12	11	9	7	4	3	1
Thorntonhill	-9	-6	-1	0	-1	-2	-5	-7	-9	-10
Glendunning House	-5	-2	2	4	3	2	-1	-3	-5	-7
Myrehaugh	-1	2	7	8	8	6	4	1	0	-2
Coulsknowe	-7	-6	-2	-1	-3	-5	-9	-12	-15	-16
Earnieside*	3	6	10	12	11	10	7	5	3	2
Cottage at Earnieside	2	5	10	11	10	9	6	4	2	1
Littlerig	-6	-5	-1	1	0	-1	-4	-6	-8	-9
Corb	-5	-2	2	4	3	2	-1	-4	-5	-7
Greenhill	-3	0	5	6	5	4	1	-1	-2	-4
Greenhill Cottage	-4	-1	3	5	4	3	0	-2	-4	-5
Blaeberry Toll	-9	-6	-1	0	0	-2	-4	-7	-8	-10

Orange (dark grey if this is printed in black and white) denotes conditions where there is a major loss of amenity, yellow (grey) indicates a significant loss of amenity and cream (pale grey) a marginal loss of amenity.

With the exception of beneficial properties there are 2 properties that will suffer a major loss of amenity, Braughty Farm and the Cottage at Earnieside and one property that will suffer a significant loss of amenity, Myrehaugh. 6 properties will suffer a marginal loss of amenity though at three of these the marginal category is only just reached at one wind speed.

5 OTHER MATTERS

I am not aware that this area is used extensively for walking or other recreational purposes.

Should the proposal be granted planning permission then there should be conditions attached that limit noise levels at surrounding properties at each wind speed. This is because alternative turbines may have higher noise levels than the presently proposed turbines and to protect residents from any turbine noise in excess of the design levels.

I am aware that there are other applications for windfarms pending in the immediate area. There will be a cumulative effect on some of those properties affected here and I propose to deal with this in a separate paper.

APPENDIX

ETSU R-97 is not, and does not claim to be, a method of assessing loss of amenity. It sets out maximum noise levels from windfarms that aim to achieve a balance between the need for windfarms and the protection of residents' amenity. The levels set are effectively the upper limits of acceptability or even higher. For example, for night time, the level proposed by ETSU R-97 is that which the World Health Organisation considered to be the highest level at which people are able to get back to sleep. This has now been revised by WHO so that the night time standard is 5dB louder than that necessary to get back to sleep.

The ETSU R-97 method is quite different from general practice in assessing loss of amenity such as the use of BS4142. It is different even from the method normally used to assess other renewable energy developments such as landfill and biomass generators.

In my opinion an Impact Statement should clearly set out the potential loss of amenity to residents. Thereafter the decision as to whether any loss of amenity is outweighed by other factors is a political one.

Normal Practice

Where a new noise is to be introduced into a residential area it is normal to set a noise limit relative to the pre-existing background noise.

What is Background Noise at a Windfarm Site?

ETSU R-97 rejects BS4142 for two reasons related to background noise. The first is that it is not applicable in low background noise levels and the second is that it should not be used when wind speeds are above 5m/s. I see no reason to reject the principle of the method on these grounds.

Low Background Noise

In low background noise levels much is often made of the suggestion that BS4142 precludes its own use where background levels are less than 30dBA. The current standard (which was published after ETSU R-97) actually says that *the method is not suitable . . . . when the background and rating noise levels are both very low.* Very low is defined as less than 30dB for the background level and less than 35dB for the rating level. So any affected property with a turbine level of 33dBA (as measured by ETSU-R-97) would be covered by BS4142.

The fact is that some measure of loss of amenity needs to be applied below a background level of 30dB and there is nothing better at present than to use the same method of comparing turbine noise with background.

Wind

BS4142 also requires that measurements be made with wind speeds less than 5m/s. There are two reasons for this. The first is that, for most assessments, windy weather is not representative of quiet times and the second is that noise may be created by wind on the measuring equipment. Clearly the procedure needs some modification for wind turbines because they do not generally operate until wind speeds reach

around 4m/s and it would be unreasonable to base the assessment in calm conditions when the turbines would not be working. BS4142 is looking for the noise level in the quietest normal circumstances. With wind farms it would be reasonable to make background noise measurements when wind speeds at the development site were in the range at which the turbines operate. In fact, ETSU R-97 accepts this point and does make background measurements in this way. Clearly care needs to be taken to ensure that wind noise on the microphone is not a factor.