

Upper Ogmores WF – Noise Issues

Review of Local Impact Reports

for RES

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1. INTRODUCTION

- 1.1 This document forms a response to noise issues raised in the Local Impact Reports, from Bridgend and Neath Port Talbot County Borough Councils, which have been submitted as part of the examination of the proposal for a wind farm at Upper Ogmores between Abergwynfi, Blaengarw and Nant-y-Moel.

2. BRIDGEND COUNTY BOROUGH COUNCIL

Overview

- 2.1 The Bridgend County Borough Council (BCBC) comments on noise are provided at section 12 of their Local Impact Report (LIR). It is stated that the Acoustic Assessment (Chapter 10) of the ES has been reviewed by the Council's Noise Pollution Control Officer in the Shared Regulatory Services Section (SRSS) which comprises BCBC together with Cardiff Council and Vale of Glamorgan Council.
- 2.2 BCBC appear to have accepted the underlying wind turbine noise assessment methodology of ETSU-R-97¹, as used by the Applicant as the basis for their assessment, although this is not specifically stated in the LIR. ETSU-R-97 comprises current national planning guidance on wind farm noise planning and specifies noise limits related to background noise level², subject to lower limiting values which differ between day-time and night-time hours. These are provided at Tables 10.13 and 10.14 of the ES for properties potentially affected by the Proposed Development, at which data is available, and as extrapolated for other properties as described at Table 10.15. The ETSU-R-97 noise limits apply to all wind farm noise affecting any residential property such that, where any such property is already affected by noise from an existing wind farm, or wind farms, a cumulative assessment is required to demonstrate that the ETSU limits are not exceeded cumulatively.

¹ ETSU-R-97, The Assessment of noise from Wind Farms, DTI, 1996

² In the absence of any wind turbine noise

- 2.3 This is the process which has been followed by the Applicant at paragraphs 10.128 – 10.159 of the ES with corresponding mitigation proposed at paragraphs 10.160 - 10.172. An alternative approach can be followed wherein the remaining noise budget (RNB) available to the new wind farm (the Proposed Development, in this case) is calculated by subtracting (in decibel terms³) the predicted noise level from existing development. The two approaches are equally valid and where an exceedance of the limits is shown by one it will also be shown by the other. The second approach is also useful in providing limits to apply to the new site by way of planning conditions, since limits on cumulative noise present significant legal and technical difficulties, and that is the approach taken by the Applicant in informing the noise limits proposed in Appendix 10.8.
- 2.4 The comments from BCBC are only concerned with cumulative impact; both from the point of view of the way this has been assessed and the proposed limits for regulating it through planning conditions on any consent granted for the Proposed Development. BCBC have specifically not commented on the mitigation proposed by the Applicant to ensure that cumulative noise does not exceed the ETSU-R-97 limits other than in their concluding remarks where it is suggested, due, it is believed, to a misunderstanding, that it is insufficient.
- 2.5 It should be noted that discussions are ongoing between the Applicant and SRSS in order that mutually acceptable conditions can be agreed prior to any hearing session on noise and, preferably, prior to Hearing Statements being submitted.

Specific Points Raised by BCBC

BCBC IR Paragraph 12.2

- 2.6 As discussed at Paragraph 2.3 (above), there are essentially two ways of assessing cumulative impact and, as discussed above, where an exceedance of the limits is shown by one methodology it will also be shown by the other. It should be noted, however, that in such circumstances the exceedance which are shown by the two methodologies will almost always be different, because that shown by the first methodology is the cumulative exceedance of the cumulative limits, whereas that shown by the second is the exceedance of the RNB by the new site. Essentially this second exceedance is the amount by which the new site has to reduce its noise level to prevent cumulative exceedance of the cumulative noise limits.
- 2.7 Paragraph 12.2 of the BCBC LIR notes that the limits initially proposed by THE APPLICANT in Appendix 10.8 of the ES, to regulate noise from the Proposed Development when acting cumulatively with other nearby developments, are exceeded by the predicted noise levels from

³ Decibel subtraction is less straightforward than arithmetic subtraction and the remaining noise budget is calculated as $RNB = 10 \times \log [10^{(Limit/10)} - 10^{(Predicted\ Existing\ Noise\ Level/10)}]$. By way of illustration, if the limit is 40 and the predicted existing noise level is 38 then the RNB would be 35.7.

the development acting alone. BCBC suggest that this is at odds with what is stated in the ES which is not, however, the case for the reasons given above. To re-cap, the cumulative assessment considers the cumulative noise level from all wind farms and compares this with the overall ETSU-R-97 noise limits which apply. In contrast, the comparison which BCBC apply considers the noise from the Proposed Development acting alone and compares this with the noise limits which are proposed to ensure cumulative impact is below the overall ETSU-R-97 noise limits.

- 2.8 Further to the above, the Applicant has fully considered both the cumulative noise, in respect of the overall noise limits, and the noise from the Proposed Development acting alone, in respect of the proposed noise limits on that site alone. The Applicant has also demonstrated that a mitigation strategy, in which certain turbines can be curtailed slightly, by reducing rotational speed, and hence noise, for a minority of wind speeds and wind directions, in order to meet both sets of limits. This is clearly set out in ES paragraphs 10.160 to 10.172 and more specifically at ES Table 10.37. The results of applying this strategy are set out at Charts 14 and 15 in ES Appendix 10.7 for H7 and H13 respectively as representative of the worst-case exceedances in Blaengarw (H7) and Abergwynfi (H13). It can be seen by comparing the predicted noise for the Proposed Development, and predicted cumulative noise, with the limits proposed at Appendix 8, and the overall ETSU-R-97 limits applied, respectively that these are both met by the proposed mitigation strategy.
- 2.9 It can be seen, therefore, that there is no discrepancy in the information presented in the Acoustic Assessment presented by the Applicant and such exceedances as have been identified have been completely covered by the mitigation proposals identified contrary to what is stated in BCBC's concluding remarks on noise.

BCBC IR Paragraph 12.3

- 2.10 BCBC note that the limits proposed are predicted to be met by a considerable margin at some properties, particularly at lower wind speeds. This is generally the case for wind farm development where predicted noise levels can be quite low at more distant properties covered by planning conditions, and at low wind speeds where turbine noise output is significantly lower than at more critical wind speeds around that for 'rated' power output due to the variable speed nature of modern turbines. Although it is not common practice to reduce the noise limits in these circumstances, the Applicant is currently considering whether a reduction in the noise limits can be accommodated in such circumstances, and by how much, in order to reach agreement with the two councils.

- 2.11 BCBC also state that the turbines at the nearby Llynfi Afan, Fforch Nest/Pant-Y- Wal and Pant-Y-Wal extension wind farms are operating '*up to or close to their consented limits*'. No evidence for this is provided and it is known, through Hayes McKenzie's involvement with the compliance measurements at Llynfi Afan, that no turbine shut-downs were carried out during the compliance measurements so, although it could be determined that limits were not exceeded, how much of the measured noise levels were caused by the turbines, and how much by other sources, could not be determined. In fact the noise levels assumed for Llynfi-Afan at the most critical wind speeds of 6 and 7 m/s, are identical to the operational noise levels, including background noise, measured during the compliance tests and as such can be considered conservative. The extent to which this applies to compliance measurements carried out for the other sites is currently unknown.
- 2.12 The limits proposed for Upper Ogmere have been derived by assuming that the 'other' sites are operating at the noise levels predicted in ES Paragraphs 10.128 using the 'controlling property' principle outlined in the Institute of Acoustics (IoA) Good Practice Guide⁴. Paragraph 5.4.9 of the Good Practice guide states that '*it may be the case that for the existing wind farm to operate to the total ETSU-R-97 noise limits at a key cumulative receptor it would have to breach the noise limit at another receptor (i.e. a receptor closer to the existing wind farm than the key cumulative receptor). Consideration could then be given to the available 'headroom' at the key cumulative receptor such a scenario permits*'. Paragraph 5.4.10 of the Good Practice Guide goes on to illustrate this with an example wherein '*wind farm A is conditioned to the same noise limit at properties R2 and R3; however, it could not produce noise levels equal to the limit at property R2 without breaching this limit at property R3 which is closer. Therefore lower immission levels can be assumed at R2 than at R3, and there may be sufficient headroom for wind farm B to use*'.
- 2.13 Using this principle, the turbine noise predicted at each property considered, is scaled up (increased at all wind speeds) by the closest margin by which it meets the limits at the nearest affected property. In this case, where its own limits are exceeded for certain wind speeds, the predicted noise levels from other development are reduced, but only at those wind speeds, The noise limits available for the Proposed Development are then derived by subtracting the predicted noise levels for all such other sites combined from the overall ETSU-R-97 limits to give the remaining noise budget (RNB) for the site.
- 2.14 The last comment in the BCBC IR is that '*the suggested noise immisions in Tables A & B do not sufficiently protect the amenities of the residents*'. No justification for this is provided and, in order for this to be addressed, it is important for the Applicant to understand the reasons for this. Discussions are ongoing with BCBC on appropriate noise limits to be applied and which could be incorporated in planning conditions on any consent. In the meantime it is perhaps instructive to

⁴ A Good Practice Guide to the Application of ETSU-R-97 for the Assessment & Rating of Wind Farm Noise, UK Institute of Acoustics, 2013

examine the amount by which the Proposed Development would add to the calculated noise levels for each wind speed at the properties highlighted in Charts 14 & 15 in ES Appendix 10.7 and also for properties H4 and H11 which are referred to in the BCBC IR. These are provided at Table 1 below.

Table 1 – Increase in Noise from Upper Ogmores from ES Data

	Standardised 10m Height Wind Speed (m/s)											
	1	2	3	4	5	6	7	8	9	10	11	12
	Noise Level (dB LA90)											
H7												
Noise Limit	37.5	37.5	37.5	37.5	37.5	37.5	37.7	38.9	39.8	40.0	40.0	40.0
Upper Ogmores	24.5	24.5	24.5	26.2	30.0	32.9	32.7	33.1	33.3	36.3	36.3	36.3
Predicted Other Sites	28.8	28.8	28.8	29.6	34.0	35.6	36.0	36.6	37.0	37.0	37.0	37.0
Predicted Total Cumulative	30.2	30.2	30.2	31.2	35.5	37.5	37.7	38.2	38.5	39.7	39.7	39.7
Predicted Increase	1.4	1.4	1.4	1.6	1.5	1.9	1.7	1.6	1.6	2.7	2.7	2.7
H13												
Noise Limit	37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.7	39.8	39.8	39.8
Upper Ogmores	18.6	18.6	18.6	20.2	24.1	27.2	27.4	27.5	27.6	30.4	30.4	30.4
Predicted Other Sites	29.6	29.6	29.6	30.2	34.6	36.2	36.6	37.2	37.5	37.5	37.5	37.5
Predicted Total Cumulative	29.9	29.9	29.9	30.6	35.0	36.7	37.1	37.6	37.9	38.3	38.3	38.3
Predicted Increase	0.3	0.3	0.3	0.4	0.4	0.5	0.5	0.4	0.4	0.8	0.8	0.8
H4												
Noise Limit	37.5	37.5	37.5	37.5	37.5	37.5	37.7	38.9	39.8	40.0	40.0	40.0
Upper Ogmores	23.7	23.7	23.7	25.3	29.2	32.2	32.1	32.3	32.5	35.5	35.5	35.5
Predicted Other Sites	28.9	28.9	28.9	29.6	33.6	35.6	36.0	36.6	36.9	36.9	36.9	36.9
Predicted Total Cumulative	30.0	30.0	30.0	31.0	35.0	37.2	37.5	38.0	38.3	39.3	39.3	39.3
Predicted Increase	1.1	1.1	1.1	1.4	1.3	1.6	1.5	1.4	1.3	2.3	2.3	2.3
H11												
Noise Limit	37.5	37.5	37.5	37.5	37.5	37.5	37.7	38.9	39.8	40.0	40.0	40.0
Upper Ogmores	24.4	24.4	24.4	26.0	29.9	32.8	32.5	33.0	33.2	36.2	36.2	36.2
Predicted Other Sites	28.9	28.9	28.9	29.6	34.0	35.7	36.1	36.6	37.0	37.0	37.0	37.0
Predicted Total Cumulative	30.2	30.2	30.2	31.2	35.4	37.5	37.7	38.2	38.5	39.6	39.6	39.6
Predicted Increase	1.3	1.3	1.3	1.6	1.4	1.8	1.6	1.6	1.5	2.6	2.6	2.6

2.15 It can be seen that the predicted cumulative level is no higher than the cumulative limit, except at H13 where the exceedance is no more than 0.2 dB, and that the increase due to Upper Ogmores

is no more than 3 dB which is the point at which any increase would become noticeable. At H13, where the predicted exceedances occur, the contribution from Upper Ogmore is less than 0.5 dB.

- 2.16 There is also a suggestion in BCBC IR Paragraph 12.3 that it should not be the predicted noise levels which are assessed but the suggested noise limits. There is some justification for this procedure but, in general terms and by their very nature, any suggested noise limits are always going to show compliance with themselves so it is difficult to understand how this would work other than if the stand-alone limits to be applied to the Proposed Development were to be added to the predicted cumulative noise to show compliance with the overall ETSU-R-97 limits. Since this is the basis on which the cumulative limits have been derived then nothing much would be gained from this exercise. It is respectfully suggested that the purpose of an assessment such as this is to demonstrate that compliance with the accepted noise limits can be met or, where this is not shown, to demonstrate the level of mitigation which is likely to be required.

BCBC IR Paragraph 12.4

- 2.17 These comments, that Llynfi Afan and Pant-Y-Wal extension wind farms, together with Fforch Nest and Pant-Y-Wal are operating '*up to or close to their consented limits*' repeats what is said in BCBC IR paragraph 12.3 and the same response also applies here as does the comment using the limits, as opposed to the predicted noise level applies similarly. The additional factor introduced by BCBC here is that the 'other' wind farms should also be assumed to be operating at their limits in any cumulative assessment. This is, however, a physical impossibility in practice as it can be seen, for instance from Figure 10.2 that there is no physical possibility of the Pant-Y-Wal / Fforch Nest turbines operating at whatever noise limits might exist in planning for properties in Blaengarw, whilst simultaneously meeting limits set at property H15. This is the basis of the controlling property principle which has been applied here, as recommended in the IoA Good Practice Guide, as a pragmatic approach to the assumptions which should be made about noise from existing wind farms for the purposes of cumulative assessment. In addition, downwind propagation from Pant-Y-Wal / Fforch Nest, under which conditions its limits have to be met, cannot occur simultaneously with downwind propagation from the Proposed Development. Furthermore, the significant extent to which the limits at low wind speeds are met, and to which BCBC object to, also indicate the physical impossibility of a wind farm site operating at its limits at low wind speeds.

BCBC IR Paragraph 12.5

- 2.18 The conclusion to the BCBC IR comments on noise states that '*the developers would be immediately in breach of their own consented limits if looking at the suggested levels [limits] in Table B [of ES Appendix 10.8]*'. This is, in fact, not the case since the mitigation envisaged by the

Applicant to meet these limits is clearly set out at ES paragraphs 10.160 to 10.172 and more specifically at ES Table 10.37.

- 2.19 It is further stated that BCBC are of the view that *'the development would have a negative impact on the living conditions of existing residents'* and that *'the cumulative assessment has underestimated this impact, particularly at locations H4, H7 and H14'*. It is acknowledged by BCBC that *'the developers are proposing a turbine management scheme to mitigate the noise impact'* but BCBC do not consider this is adequate because they do not consider cumulative impact has been modelled correctly. Although, the adequacy of the modelling, has been addressed above, discussions are ongoing with BCBC to agree conditions on the Proposed Development acting alone, which would prevent cumulative exceedance of the ETSU-R-97 noise limits, to their satisfaction.

BCBC IR Appendix I

- 2.20 BCBC IR Appendix I comprises a copy of the observations received from the SRS Noise Pollution Control Officer. This does not introduce anything different to the issues raised above, except in respect of proposed planning conditions on noise where changes and additional conditions to those proposed by the Applicant in ES Appendix 10.8 have been inserted. It is noted that these are not included in the main body of the BCBC IR where proposed planning conditions are included at section 17.

3. NEATH PORT TALBOT COUNTY BOROUGH COUNCIL

Overview

- 3.1 The Neath Port Talbot County Borough Council (NPTCBC) comments on noise are provided at section 8 of their Local Impact Report (LIR). It is noted that only 3 of the properties assessed in the noise section of the ES (H6, H9 and H13) are in NPTCBC and all are in Abergwynfi, the closest location to the Proposed Development in NPTCBC.
- 3.2 NPTCBC observe that a mitigation scheme could be used to control cumulative operational impacts which, if implemented via a suitable condition, would reduce any noise impacts to a 'neutral' level. It is noted that no noise limits on the wind farm are proposed and it is suggested that any such mitigation condition should be worded in such a way that it would require demonstration that any agreed limits on operational noise would be met for the eventual turbines to be installed at the site including the details of any proposed mitigation scheme.
- 3.3 NPTCBC also request a reduction in Saturday working hours for construction activities. In practice, this comes down to predicted levels of construction noise above the relevant criteria for

Saturday afternoon periods based on a worst case assumption of all construction traffic passing through Abergwynfi. It is suggested that, in practice, a restriction on site construction work on Saturday afternoons would not be necessary but that a limit on construction traffic through Abergwynfi at such times might be appropriate. It appears that if a working hours condition for construction activities can be agreed then similarly any such impacts would be considered as being at a 'neutral' level.

- 3.4 It is proposed that the wording of the conditions, provided at Section 10 of the NPTCBC IR in line with the above, will be discussed with NPTCBC and hopefully agreed prior to any hearing session on conditions.

4. PROPOSED CONDITIONS

- 4.1 The proposed conditions on noise included in Appendix I of the BCBC IR are reproduced as Appendix A to this response with commentary and mark-up. The Tables of limits have not been included as these are currently under discussion with BCBC.

Appendix A

Conditions on Noise

(Under Discussion)

The text below incorporates changes made by BCBC to those proposed in the ES. Where the changes are not agreed, this has been noted.

1. The rating level of noise immissions from the combined effects of the wind turbines (including the application of any tonal penalty) when determined in accordance with the attached Guidance Notes, shall not exceed the values for the relevant integer wind speeds set out in the attached Table A or Table B (as appropriate). Noise limits for dwellings which lawfully exist or have planning permission for construction at the date of this consent but are not listed in the Tables attached shall be those of the physically closest location listed in the Tables unless otherwise agreed with the Local Planning Authority. The coordinate locations to be used in determining the location of each of the dwellings listed in Tables A and B shall be those listed in Table C.

2. Within 21 days from the receipt of a written request from the Local Planning Authority and following a complaint to the Local Planning Authority from the occupant of a dwelling which lawfully exists or has planning permission at the date of this consent alleging noise disturbance at that dwelling, the wind farm operator shall, at the wind farm operators expense, employ an independent consultant approved by the Local Planning Authority to assess the level of noise immissions from the wind farm at the complainant's property following the procedures described in the attached Guidance Notes.

3. The wind farm operator shall provide to the Local Planning Authority the independent consultant's assessment and conclusions of the rating level of noise immissions undertaken in accordance with the Guidance Notes and conclusions regarding the said noise complaint, including all calculations, audio recordings and the raw data upon which those assessments and conclusions are based. Such information shall be provided within 2 months of the date of the written request of the Local Planning Authority, with an additional 3 weeks allowed should further investigation and assessment of the rating level of noise immissions from the wind farm pursuant to Guidance Note 4 be required, unless otherwise extended in writing by the Local Planning Authority.

4. Once the Local Planning Authority has received the independent consultant's noise assessment required by this condition, including all noise measurements and any audio recordings, where the Local Planning Authority is satisfied of an established breach of the noise limits set out in the attached Tables 1 & 2, upon notification by the Local Planning Authority in writing to the wind farm operator of the said breach, the wind farm operator shall within 21 days propose a scheme for the approval of the Local Planning Authority. The scheme shall be designed to mitigate the breach and to prevent its future recurrence. This scheme shall specify the timescales for implementation. The scheme shall be implemented as approved by the Local Planning Authority and according to the timescales within it. The scheme as implemented shall be retained thereafter unless otherwise agreed with the Local Planning Authority.

5. Where a dwelling to which a complaint is related is not listed in Table 3 attached to these conditions, the wind farm operator shall submit to the Local Planning Authority for written approval proposed noise limits selected from those listed in the Tables 1 and 2 to be adopted at the complainant's dwelling for compliance checking purposes. *The proposed noise limits are to be those limits selected from the Tables specified for a listed location which the independent consultant considers as being likely to experience the most similar background noise environment and to that experienced at the complainant's dwelling.* The rating level of noise immissions resulting from the combined effects of the wind turbines when determined in accordance with the attached Guidance Notes shall not exceed the noise limits approved in writing by the Local Planning Authority for the complainant's dwelling.

Highlighted sentence to be removed as the limits applied will be dependant also on the contribution of noise from other developments.

6. The assessment of the rating level of noise immissions shall be undertaken in accordance with an assessment protocol that shall previously have been submitted to and approved in writing by the Local Planning Authority. The protocol shall include the proposed measurement location identified in accordance with the Guidance Notes where measurements for compliance checking purposes shall be undertaken, whether noise giving rise to the complaint contains or is likely to contain a tonal component, and also the range of meteorological and operational conditions (which shall include the range of wind speeds, wind directions, power generation and times of day) to determine the assessment of rating level of noise immissions. The proposed range of conditions shall be those which prevailed during times when the complainant alleges there was disturbance due to noise, having regard to the written request of the Local Planning Authority under condition 4, and such others as the independent consultant considers likely to result in a breach of the noise limits.

7. Wind speed, wind direction and power generation data shall be continuously logged and provided to the Local Planning Authority at its request and in accordance with the attached Guidance Notes within 14 days of such request. Such data shall be retained for a period of not less than 24 months.

8. For the purposes of demonstrating compliance with the levels stated in Tables A and B, during the first 12 months of operation, the wind farm operator shall, at its expense, employ a consultant approved by the Local Planning Authority to assess the level of noise immissions from the wind farm, according to the measurement protocol agreed with the Local Planning Authority.

9. In the event that the proposed turbine model for installation differs from the noise levels/ machine utilised in *the noise report entitled 'Proposed Wind Farm extension- Noise Assessment Report- January 2015'*, a revised noise assessment report shall be submitted, demonstrating that predicted noise levels indicate likely compliance with the limits stated in Tables A and B.

Highlighted text appears to be erroneous. The Applicant is however content with the principle proposed.

10. *Upon request of the Local Planning Authority, following a complaint to it about noise immissions from either the existing Llynfi Afan Wind Farm, FForch Nest, Pant-Y-Wal or Pant-Y-Wal extension Wind*

Farms, the wind farm operator shall, if requested shut down the turbines at the Upper Ogmores Wind Farm for such period that the Local Planning Authority reasonably requires, to enable an assessment to be carried out either by an appointed consultant or the Local Authority to enable isolated monitoring to be undertaken to determine the contribution of noise from each wind farm.

This condition is unreasonable and not necessary to establish noise from the specified sites which can be established through shut-downs of whichever site which is being tested.

11. No development shall commence until there has been submitted to the Local Planning Authority details of a nominated representative for the development to act as a point of contact for local residents (in connection with conditions 1 -6) together with the arrangements for notifying and approving any subsequent change in the nominated representative. The nominated representative shall have responsibility for liaison with the Local Planning Authority in connection with any noise complaints made during the construction, operation and decommissioning of the wind farm.

12. A scheme of mitigation for the management of the turbines in order to reduce the noise from the cumulative impact shall be submitted to and agreed with the Local Planning Authority to demonstrate that the Upper Ogmores Wind farm, when operating cumulatively with the other existing Wind Farms, based upon their respective consented limits, do not exceed the ETSU-R-97 derived limits obtained from Tables 10.5 and 10.6 of Chapter 10 of the Environmental Statement. The scheme shall be implemented as agreed and maintained and retained for as long as the development remains in existence.

This condition essentially replicates Condition 9. If such a condition is to be agreed it should refer to the more complete Tables A and B attached to these proposed conditions, which refer to this development alone, and should be combined with Condition 9. In particular, the 'other existing wind farms' referred to may not have limits at the properties listed at Tables 10.5 and 10.6 of the ES. As per condition 9, any such condition should only require demonstration that the limits will be met, including mitigation as necessary, not for that mitigation to be specifically approved by the LPA.

Tables of Noise Limits Relating to Condition 1

The format of Tables A B & C and the content of Table C is agreed. The content of Tables A and B are under discussion.

Guidance Notes For Noise Conditions

These notes are to be read with and form part of the noise conditions. They further explain the condition and specify the methods to be employed in the assessment of complaints about noise immissions from the wind farm. The rating level at each integer wind speed is the arithmetic sum of the wind farm noise level as determined from the best-fit curve described in Guidance Note 2 of these Guidance Notes and any tonal penalty applied in accordance with Guidance Note 3. Reference to ETSU-R-97 refers to the

publication entitled “The Assessment and Rating of Noise from Wind Farms” (1997) published by the Energy Technology Support unit (ETSU) for the Department of Trade and Industry (DTI).

Guidance Note 1

(a) Values of the LA90,10-minute noise statistic should be measured at the complainant's property, using a sound level meter of EN 60651/BS EN 60804 Type 1, or BS EN 61672 Class 1 quality (or the equivalent UK adopted standard in force at the time of the measurements) set to measure using the fast time weighted response as specified in BS EN 60651/BS EN 60804 or BS EN 61672-1 (or the equivalent UK adopted standard in force at the time of the measurements). This should be calibrated in accordance with the procedure specified in BS 4142: 1997 (or the equivalent standard thereof). Measurements shall be undertaken in such a manner to enable a tonal penalty to be applied in accordance with Guidance Note 3. These measurements shall be made in such a way to enable a tonal penalty to be applied in accordance with Guidance Note 3 to satisfy that the requirements of Guidance Note 3. shall also be satisfied.

(b) The microphone should be mounted at 1.2 - 1.5 m above ground level, fitted with a two layer windshield (or suitable alternative approved in writing from the Local Planning Authority), and placed outside the complainant's dwelling. Measurements should be made in “free-field” conditions. To achieve this, the microphone should be placed at least 3.5m away from the building facade or any reflecting surface except the ground at a location agreed with the Local Planning Authority.

(c) The LA90,10min measurements shall be synchronised with measurements of the 10-minute arithmetic mean wind speed and with operational data logged in accordance with Guidance Note 1(d), including power generation information for each wind turbine, from the turbine control systems of the wind farm.

Wording Proposed by the Applicant

(d) The wind farm operator shall continuously log arithmetic mean wind speed and arithmetic mean wind direction data in 10 minute periods on the wind farm site to enable compliance with the conditions to be evaluated. The mean wind speed at hub height shall be 'standardised' to a reference height of 10 metres as described in ETSU-R-97 at page 120 using a reference roughness length of 0.05 metres. It is this standardised 10m height wind speed data which is correlated with the noise measurements of Note 2(a) in the manner described in Note 2(c).

Wording Proposed by BCBC

(d) To enable compliance with the conditions to be evaluated, the wind farm operator shall continuously log arithmetic mean wind speed and wind direction at hub height for each turbine and arithmetic mean power generated by each turbine, all in successive 10-minute periods, unless otherwise agreed in writing with the Local Planning Authority. **During any noise compliance test, the mean wind speed and**

wind direction shall also be measured on-site at a height of 10m above ground level. The wind speed measurement shall not be unduly affected by any turbine wake. It is this measured 10 metre height wind speed data which is correlated with the noise measurements determined as valid in accordance with Guidance Note 2, such correlation to be undertaken in the manner described in Guidance Note 2. All 10-minute periods shall commence on the hour and in 10-minute increments thereafter. In the event that it is not possible to undertake wind speed measurements at 10m, the wind speed can be measured at another height and converted to a height of 10m according to a method to be agreed with the Local Planning Authority.

This wording, particularly that highlighted, is not agreed as the noise limits are specified in terms of standardised 10m height wind speed and, despite what is said in BCBC Appendix I, this wording is not taken from the Institute of Acoustics Good Practice Guide. The wording from the Good Practice Guide is reproduced below for completeness and can be agreed.

IoA Good Practice Guide Wording

(d) To enable compliance with the conditions to be evaluated, the wind farm operator shall continuously log arithmetic mean wind speed in metres per second and wind direction in degrees from north at hub height for each turbine and arithmetic mean power generated by each turbine, all in successive 10-minute periods. Unless an alternative procedure is previously agreed in writing with the Planning Authority, this hub height wind speed, averaged across all operating wind turbines, shall be used as the basis for the analysis. All 10 minute arithmetic average mean wind speed data measured at hub height shall be 'standardised' to a reference height of 10 metres as described in ETSU-R-97 at page 120 using a reference roughness length of 0.05 metres . It is this standardised 10 metre height wind speed data, which is correlated with the noise measurements determined as valid in accordance with Guidance Note 2, such correlation to be undertaken in the manner described in Guidance Note 2. All 10-minute periods shall commence on the hour and in 10- minute increments thereafter.

(e) Data provided to the Local Planning Authority in accordance with the noise condition shall be provided in comma separated values in electronic format with the exception of audio data which shall be supplied in the format in which it is recorded.

Italicised Text added by BCBC. Suggested addition highlighted.

Guidance Note 2

(a) The noise measurements shall be made so as to provide not less than 20 valid data points as defined in Note 2 paragraph (b). Such measurements shall provide valid data points for the range of wind speeds, wind directions, times of day and power generation requested by the Local Planning Authority. In specifying such conditions the Local Planning Authority shall have regard to those conditions which were most likely to have prevailed during times when the complainant alleges there was disturbance due to noise or which are considered likely to result in a breach of the noise limits.

(b) Valid data points are those that remain after all periods during rainfall have been excluded. Rainfall shall be assessed by use of a rain gauge that shall log the occurrence of rainfall in each 10minute period concurrent with the measurement periods set out in Note 1(c) and is situated in the vicinity of the sound level meter.

BCBC wording

(c) For those data points considered valid in accordance with Guidance Note 2(b), values of the LA90,10-minute noise measurements and corresponding values of the 10-minute wind speed, as measured at a ten metre height wind speed using the procedure specified in Guidance Note 1(d), shall be plotted on an XY chart with noise level on the Y-axis and the measured 10m mean wind speed on the X-axis. A least squares, “best fit” curve of a maximum 2nd order polynomial or otherwise as may be agreed with the local planning authority shall be fitted between the standardised mean wind speed (as defined in Note 1 paragraph (d)) plotted against the measured LA90,10min noise levels. The noise level at each integer speed shall be derived from this best-fit curve.

The highlighted wording is not accepted. Again, despite what is said in BCBC Appendix I, this wording is not taken from the Institute of Acoustics Good Practice Guide which is reproduced below for completeness and which can be agreed.

IoA Good Practice Guide wording

(c) For those data points considered valid in accordance with Guidance Note 2(b), values of the LA90,10 minute noise measurements and corresponding values of the 10- minute wind speed, as derived from the standardised ten metre height wind speed averaged across all operating wind turbines using the procedure specified in Guidance Note 1(d), shall be plotted on an XY chart with noise level on the Y-axis and the standardised mean wind speed on the X-axis. A least squares, “best fit” curve of an order deemed appropriate by the independent consultant (but which may not be higher than a fourth order) should be fitted to the data points and define the wind farm noise level at each integer speed.

Guidance Note 3

Where, in the opinion of the Local Planning Authority, noise immissions at the location or locations where assessment measurements are being undertaken contain a tonal component, the following rating procedure shall be used:

(a) For each 10-minute interval for which LA90,10-minute data have been determined as valid in accordance with Guidance Note 2 a tonal assessment shall be performed on noise immissions during 2 minutes of each 10-minute period. The 2-minute periods should be spaced at 10-minute intervals provided that uninterrupted uncorrupted data are available (“the standard procedure”). Where uncorrupted data are not available, the first available uninterrupted clean 2-minute period out of the affected overall 10-minute period shall be selected. Any such deviations from the standard procedure, as described in Section 2.1 on pages 104-109 of ETSU-R-97, shall be reported.

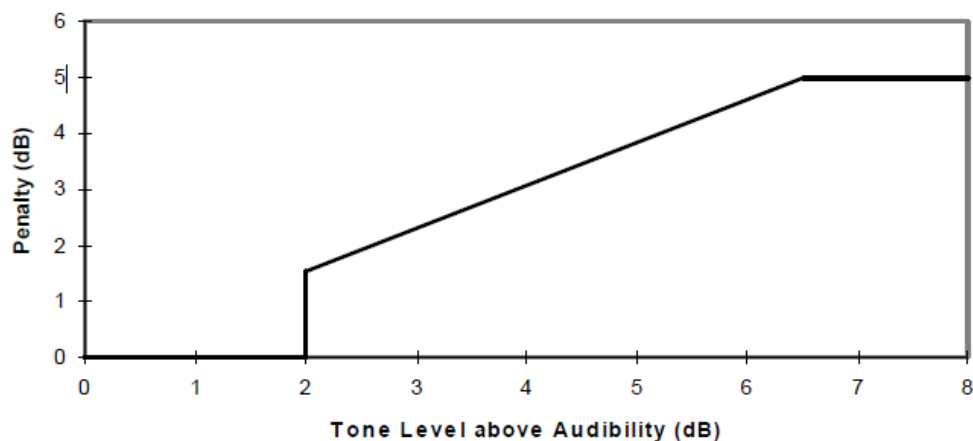
(b) For each of the 2-minute samples the tone level above or below audibility shall be calculated by comparison with the audibility criterion given in Section 2.1 on pages 104-109 of ETSU-R-97.

(c) The tone level above audibility shall be plotted against wind speed for each of the 2-minute samples. Samples for which the tones were below the audibility criterion or no tone was identified, a value of zero audibility shall be substituted.

(d) A least squares "best fit" linear regression line shall then be performed to establish the average tone level above audibility for each integer wind speed derived from the value of the "best fit" line at each integer wind speed. If there is no apparent trend with wind speed then a simple arithmetic mean shall be used. This process shall be repeated for each integer wind speed for which there is an assessment of overall levels in Guidance Note 2.

The wording proposed by the Applicant for c) and d) is to be preferred as the IoA Good Practice Guide version used here is incorrect and could allow tone levels to be under-stated.

(e) The tonal penalty is derived from the margin above audibility of the tone according to the figure below.



Guidance Note 4

(a) If a tonal penalty is to be applied in accordance with Guidance Note 3 the rating level of the turbine noise at each wind speed is the arithmetic sum of the measured noise level as determined from the best fit curve described in Note 2 and the penalty for tonal noise as derived in accordance with Guidance

Note 3 at each integer wind speed within the range specified by the Local Planning Authority in its written assessment protocol.

(b) If no tonal penalty is to be applied then the rating level of the turbine noise at each wind speed is equal to the measured noise level as determined from the best fit curve described in Guidance Note 2.

(c) In the event that the rating level is above the limit(s) set out in Tables A and B attached to the noise conditions or the noise limits for alternative agreed complainant's dwelling, the independent consultant shall undertake a further assessment of the rating level to correct for background noise so that the rating level relates to wind turbine noise immission **from the site, hereby consented**, only.

Text added by the Applicant

(d) The wind farm operator shall ensure that all the wind turbines in the development are turned off for such period as the independent consultant reasonably requires to undertake the further assessment or any other assessment to determine compliance with tables A and B as attached. The further assessment shall be undertaken in accordance with the following steps:

- (i) Repeating the steps in Guidance Note 2, with the wind farm switched off, and determining the background noise (L3) at each integer wind speed within the range requested by the Local Planning Authority in its written request and the approved protocol.
- (ii) The wind farm noise (L1) at this speed shall then be calculated as follows where L2 is the measured level with turbines running but without the addition of any tonal penalty:

$$L_1 = 10 \log \left[10^{L_2/10} - 10^{L_3/10} \right]$$

- (iii) The rating level shall be re-calculated by adding the tonal penalty (if any is applied in accordance with Guidance Note 3) to the derived wind farm noise L1 at that integer wind speed.
- (iv) If the rating level after adjustment for background noise contribution and adjustment for tonal penalty (if required in accordance with note (iii) above) at any integer wind speed exceeds the values set out in Tables A and B or exceeds the noise limits approved by the Local Planning Authority for an alternative agreed complainant's dwelling then the development fails to comply with the conditions.