

# REF

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### ***Renewable Energy Foundation Response to:***

### ***Wiltshire Council consultation on Separation Distances in the Amendment to Core Policy 42***

#### ***Introduction***

- 1.1 The Renewable Energy Foundation (REF) has been asked by Mr Chris da Costa, a Wiltshire resident, to comment on Wiltshire Council's Amendment to its Core Policy 42 on Standalone Renewable Energy Installations with particular emphasis on the technical noise evidence relevant to the policy.
- 1.2 REF regularly responds to consultations such as this one and has taken a particular interest in the issue of wind farm noise assessment. REF has produced three information notes on this subject;<sup>1</sup> the most relevant of these to Wiltshire Council's Amendment is the most recent which shows how increasing the separation distance between dwellings and turbines reduces the likelihood of noise complaints. We also suggested in that study that analysis of likelihood of complaints provides a straightforward means of quantifying loss of amenity.

#### ***ETSU-R-97 on Amenity***

- 1.3 The starting point for an assessment of the noise impact on amenity of the Council's Amendment is the document, ETSU-R-97, The Assessment and Rating of Noise from Wind Farms 1997. Although 16 years old, this guidance has been endorsed by Government in recent policy (EN-3), although clearly with some reservations insofar as the Institute of Acoustics has been tasked with writing a supplementary best practice guide to decode ETSU-R-97.

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<sup>1</sup> <http://www.ref.org.uk/publications/151-ref-publishes-data-on-wind-farm-noise-obtained-under-the-freedom-of-information-act> ;  
<http://www.ref.org.uk/publications/242-the-den-brook-amplitude-modulation-noise-condition>  
<http://www.ref.org.uk/publications/255-ioa-critique>

- 1.4 At the time ETSU-R-97 was written, the authors defined the maximum noise level which, in the absence of masking noises, would protect neighbouring amenity as 33dBA ( $L_{A90,10 \text{ mins}}$ ).<sup>2</sup> This level was based on the 1980 WHO Environmental Health Criteria which stated "a level of less than 35 dBA Leq is recommended to preserve the restorative process of sleep".<sup>3</sup>
- 1.5 The authors of ETSU-R-97 reasoned "It is also the opinion of the Noise Working Group that there is no need to restrict noise levels below a lower absolute limit of  $L_{A90,10 \text{ min}} = 33\text{dB(A)}$ ; if an environment is quiet enough so as not to disturb the process of falling asleep or sleep itself then it ought to be quiet enough for the peaceful enjoyment of one's patio or garden."<sup>4</sup>
- 1.6 However, the WHO Environmental Health Criteria were subsequently revised downward by 5dB in 1999<sup>5</sup>; thus the revised criteria for levels quiet enough for sleep became  $L_{A90,10 \text{ min}} = 28\text{dB(A)}$ .
- 1.7 Therefore, adhering to the reasoning of the authors of ETSU-R-97, the level for preservation of amenity is between 28 and 33 dB(A), and nearer the former.
- 1.8 It must be understood that the level for preserving amenity is lower than typical noise limits set for wind farms. This is because the ETSU-R-97 guidance explicitly does not set out to protect neighbourhood amenity; it provides a framework for measurement of background and wind farm noise and gives **indicative** noise levels which were considered 16 years ago to offer a **reasonable** degree of protection to wind farm neighbours without being unduly restrictive of wind farm development. (Emphasis added.)

### **Blade Swish Penalty**

- 1.9 A further consideration is that the amenity noise level assumes the noise has no character. It is recognised that any noise with a distinctive beating or tonal character is more annoying to the listener than anonymous, random noise. ETSU-R-

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<sup>2</sup> It is important for this discussion to understand two different noise metrics. The value of 33 dB is an LA90 (10 minute) noise level. This is an acoustics metric routinely used in wind farm noise assessments. It is the noise level which is exceeded for 90% of a 10 minute interval i.e. is the level of the quietest 10% of a ten minute interval. A more typical metric is an LA(eq), or the equivalent continuous noise level. It can be thought of as an average of a varying noise level over a time period. It has been generally accepted, although not rigorously tested, that a wind farm LA90(10 minute) noise level is 2 dB lower than the LA(Eq); thus 33 dB LA90,10 minutes is equivalent to 35dB LAEq. The A refers to the noise weighting system routinely used for measuring environmental noise and is designed to reflect the response of the human ear.

<sup>3</sup> Section 1.1.3.3 World Health Organisation recommendations of 1980 "Environmental Health Criteria 12: Noise"

<sup>4</sup> Page 62 ETSU-R-97

<sup>5</sup> Guidelines for Community Noise, Berglund,Lindvall,Schwela, WHO 1999.

97 recognises that wind turbine noise does include blade swish noise; that is, the regular amplitude modulation of the aerodynamic noise of the blades which leads to swishing or thumping noises at blade passing frequency. The noise levels recommended in ETSU-R-97 take into account a certain level of blade swish noise<sup>6</sup> in that it explicitly assumes there would be a variation in overall noise level of up to 2-3 dB(A) attributed to blade swish.<sup>7</sup>

- 1.10 However, in the 16 years since ETSU-R-97 was written, turbine heights have doubled, and with the increased dimensions, has come an increase in turbine noise levels and a shift in the noise profile to lower frequencies. It is now commonplace for the variation in amplitude modulation to exceed 2-3dB.<sup>8</sup>
- 1.11 ETSU-R-97 refers to the main UK environmental noise standard, BS4142, which applies a penalty of 5dB if the industrial noise source is irregular in character with tones or thumps such as to attract attention. Such a penalty was one of the draft recommendations to Government of a report by the Hayes McKenzie Partnership in 2006.<sup>9</sup> Applying such a penalty would reduce the existing ETSU-R-97 indicative day time levels to 28 dB(A). Applying such a penalty to the level described above (in paragraph 1.7) to protect amenity would reduce the acceptable range to 23-28 dB(A).
- 1.12 A further issue when considering impact on amenity is whether the noise limits set for a wind farm will trigger complaints. The BS4142 guidance notes that a noise is liable to provoke complaints whenever its level exceeds the background noise by a certain margin. This margin is defined as 10dB with a difference of 5dB being described as marginal. As we at REF have demonstrated, in quiet rural areas it is perfectly feasible that an ETSU-R-97-compliant wind farm will exceed background by 10dB or more and trigger reasonable complaints from neighbours.<sup>10</sup>

### ***Weight of ETSU-R-97***

- 1.13 It is well established that ETSU-R-97 is not to be applied inflexibly. The Appeal Court Judgement in the Gorsedd Bran case noted that the ETSU-R-97 indicative noise levels are “not the last word on ‘acceptable’ noise levels”, that individuals may be

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<sup>6</sup> See page 68 ETSU-R-97

<sup>7</sup> See page 12 ETSU-R-97

<sup>8</sup> For examples of AM noise [http://www.masenv.co.uk/listening\\_room](http://www.masenv.co.uk/listening_room) and associated links.

<sup>9</sup> See ‘Government suppresses noise protection expert advice’ at <http://www.denbrookvalley.co.uk/> and related links including : [http://www.denbrookvalley.co.uk/resources/FOI+Commentary+\\_HMP+Draft+Reports+-+7+Dec+09-2.pdf](http://www.denbrookvalley.co.uk/resources/FOI+Commentary+_HMP+Draft+Reports+-+7+Dec+09-2.pdf)

<sup>10</sup> See section entitled “Quantifying Noise Impact on Neighbouring Dwellings” at <http://www.ref.org.uk/publications/255-ioa-critique>

adversely prejudiced even by noise levels which fall below ETSU-R-97 guidelines and that it is up to the decision maker to decide if the duration of noise exposure is such that “enough is enough” and planning permission should be refused.<sup>11</sup>

### **Summary on Amenity**

1.14 Thus, to summarise: ETSU-R-97 is the current guidance on wind farm noise measurements; it provides indicative but not binding noise levels that represent a compromise which is not unduly restrictive on development but does represent a certain loss of amenity for neighbours. In order to protect amenity using the principles of ETSU-R-97, turbine noise levels must not exceed between 28dB and 33dB at neighbouring dwellings. However, if the turbine noise contains a distinct blade swish character those levels would need to drop 5dB to be between 23dB and 28dB.

### **Quantitative Impact on Amenity of Wiltshire Council Policy**

1.15 With these figures in mind it is possible to establish whether the separation distances defined in Wiltshire Council’s amendment are compatible with achieving this level of amenity protection.

1.16 Turbine manufacturers and developers are reluctant to release detailed noise data about specific turbine models.<sup>12</sup> Some limited data is made available for predicting noise levels for single turbines in ideal conditions when a planning application is made. However, local terrain, proximity to woods and other turbines, local meteorological conditions and wear and tear on installed turbines mean that real noise levels may exceed predicted levels based on a single factory-fresh turbine in ideal conditions.

1.17 With this caveat in mind, we have used four sets of input noise data obtained from various planning applications to represent typical turbines in each of the 4 height ranges defined by Wiltshire Council. Using this data and the standard methodology for calculating turbine noise at a distance,<sup>13</sup> we can calculate the predicted maximum noise levels of typical turbines at the four separation distances assuming a situation of a dwelling having a pair of turbines at the minimum separation distance.

1.18 The following table list the results of the noise prediction calculation for each of the four scenarios covered by the Wiltshire Council separation distances i.e. assuming

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<sup>11</sup> Court of Appeal Judgement, *Tegni Cymru Cyf v the Welsh Ministers & Anr* [2010] EWCA Civ 1635 <http://www.bailii.org/ew/cases/EWCA/Civ/2010/1635.html>

<sup>12</sup> See page 7 *Wind Farm Perception, Visual and Acoustic Impact of wind turbine farms on residents*, 2008, van den Berg, Pedersen, Bouma and Bakker.

<sup>13</sup> ISO 9613 assuming atmospheric conditions of 10°C and 70% humidity and hard ground.

that a dwelling may have two turbines of 50m, 100m, 150m, more than 150m to tip height at a distance of 1km, 1.5km, 2km and 3km respectively.

1.19 Table 1. Predicted turbine noise levels at Wiltshire Council Separation Distances

Turbine type.	Representing turbines of Max tip height	Max dB at source	Separation Distance	Noise Level at Separation Distance
400kW	50m	Assume 100dB	1000m	29dB
MM82	100m	105.5dB	1500m	32dB
SWT 3.6	150m	108dB	2000m	31dB
>6MW	>150m	Assume 111dB	3000m	29dB

1.20 It should be noted that the ISO 9613 standard used for the theoretical calculation has an error margin of +/- 3dB, so the values in Table 1 may understate real noise levels by up to 3dB. It is also worth repeating that local terrain, proximity to woods and other turbines, local meteorological conditions and wear and tear may also contribute to actual levels exceeding the calculations in Table 1.

### **Conclusions**

1.21 These results show that the separation distances are only borderline sufficient to protect amenity based on the ETSU-R-97 principles, and in the case of the turbines exhibiting blade swish noise in excess of that anticipated by the guidance, the separation distances would not protect amenity.

1.22 It must be noted that at these levels, turbine noise would be certainly audible at the proposed distances and in some circumstances audible indoors at night. The suggestion in previous Government guidance that turbine noise is masked by environmental noise is largely incorrect for the taller turbines of 100m or more because the frequencies making up the sound profile is quite different from that of wind-induced noise in vegetation.

1.23 In conclusion, we believe that the separation distances proposed represent a reasonable compromise between ensuring amenity of Wiltshire residents is protected and enabling development of appropriately-scaled renewable energy projects. The simplicity of the guidance is helpful in that it will prevent wholly unsuitable projects coming forward and therefore save time and money assessing such projects. Care will still need to be taken to scrutinise projects where noise levels are close to the acceptable margins in order that neighbours' amenity is preserved.

### ***About The Renewable Energy Foundation***

The Renewable Energy Foundation is a registered research and education charity encouraging the development of renewable energy and energy conservation whilst emphasizing that such development must be governed by the fundamental principles of sustainability. REF is supported by private donation and has no political affiliation or corporate membership. In pursuit of its principal goals, REF highlights the need for an overall energy policy that is balanced, ecologically sensitive, and effective.