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12 January 2018

Dear Brian,

Re: Longsyke Farm – Wind turbines – noise calculations and ETSU-R-97

It is proposed to install two Britwind R9000 domestic wind turbines at a location outside Longsyke Farm, near Haltwhistle in Northumberland. This Development has been the subject of a planning application, reference 17NP0123, supported by several documents including information on the noise emissions of the turbines. In response, the Environmental Protection Department of Northumberland County Council has requested that a site-specific noise assessment is undertaken in accordance with the methodology in ETSU-R-97 as well as good practice guidance. Hoare Lea was appointed by Britwind to undertake calculations of noise from the turbines at neighbouring residential locations in line with the above-reference guidance.

The recommendations contained in ETSU-R-97ⁱ provide a robust basis for assessing the noise implications of a wind farm. ETSU-R-97 has become the accepted standard for such developments within the UK. Guidance on good practice on the application of ETSU-R-97 has been provided by the Institute of Acoustics (IOA Good Practice Guide or GPG)ⁱⁱ.

The general ETSU-R-97 assessment procedure specifies how noise limits can be set relative to existing background noise levels at the nearest properties, reflecting the variation in both turbine background noise and source noise with wind speed. But ETSU-R-97 also offers an alternative simplified assessment methodology:

'For single turbines or wind farms with very large separation distances between the turbines and the nearest properties a simplified noise condition may be suitable. We are of the opinion that, if the noise is limited to an $L_{A90,10min}$ of 35dB(A) up to wind speeds of 10m/s at 10m height, then this condition alone would offer sufficient protection of amenity, and background noise surveys would be unnecessary. We feel that, even in sheltered areas when the wind speed exceeds 10m/s on the wind farm site, some additional background noise will be generated which will increase background levels at the property.'

In addition, ETSU-R-97 advises that for properties whose occupier is financially involved with a wind turbine development, the applicable noise limits can be increased to a minimum of 45 dB(A).

Hoare Lea was provided with a noise certification documentⁱⁱⁱ produced by Evancewind for the R9000 turbine model, describing the results of noise emission testing. The R9000 turbine model is now owned by Britwind

and two such units are proposed to be installed at the site. This information was used to determine source or noise emission levels for the turbines in accordance with the IOA GPG recommendations. The data provided was converted to a standardised 10 m height wind speed reference in accordance with current best practice. Furthermore, the sound power used was based on the “declared” sound power levels provided in the report, which include a robust allowance for expanded measurement uncertainty in line with the IOA GPG guidance. In addition, a representative sound spectrum for the turbine was determined from the test data. The resulting assumed turbine noise emission values are provided below in Tables 1 and 2.

Table 1 – Britwind R9000: wind turbine sound power levels used for analysis

Sound Power Level (dB LAeq) as a Function of Standardised 10 m wind Speed (m/s)						
4	5	6	7	8	9	10
82.0	83.8	85.7	87.5	89.3	91.2	93.0

Table 2 – Britwind R9000: octave band spectra used for analysis

A-Weighted Sound Power Level (dB(A)) at respective Octave Band Centre Frequency (Hz)							
63	125	250	500	1k	2k	4k	8k
64.2	74.1	78.5	77.7	83.9	85.4	79.5	72.5

The ISO 9613-2 propagation model has been used to calculate the noise immission levels at neighbouring residential neighbours. For the purposes of the present assessment, all noise level predictions have been undertaken using a receiver height of four metres above local ground level, mixed ground ($G=0.5$) and an air absorption based on a temperature of 10°C and 70% relative humidity. The attenuation due to terrain screening accounted for in the calculations has been limited to a maximum of 2 dB(A). In situations of propagation above concave ground (*i.e.* across a valley), a correction of +3 dB was added. This method is consistent with the recommendations of the above-referenced GPG which provides recommendations on the appropriate approach when predicting wind turbine noise levels.

Wind turbines were modelled at the following coordinates: 372951 / 568481 and 372971 / 568461 (easting and northing), based on the plans provided to Hoare Lea. Predicted noise levels are presented in terms of the LA90,T noise indicator in accordance with the recommendations of the ETSU-R-97 report, obtained by subtracting 2 dB(A) from the calculated LAeq,T noise levels based on the turbine sound power levels presented in Tables 1 and 2. Coordinates for the nearest dwellings to the proposed turbines were determined based on available mapping data. The resulting predicted levels are set out in Table 3 below.

It is apparent from Table 3 that predicted LA90 noise levels at wind speeds of up to 10 m/s do not exceed 35 dB LA90 at almost all properties. This therefore satisfies the simplified assessment criteria of ETSU-R-97. The only exception is Longsyke Farm, where predicted levels are of up to 45 dB for wind speeds of up to 10 m/s. Hoare Lea was advised that this property is owned and occupied by the applicant of this development, and is therefore financially involved with the scheme. An increased limit of 45 dB LA90 at least would therefore apply at this property, and the predicted levels of Table 3 comply with this noise limit.

Although increased noise levels would be predicted at higher wind speeds above 10 m/s, it is Hoare Lea's experience that, for these strong wind speeds, background noise levels would be elevated in this conditions, as noted in the extract from ETSU-R-97 cited above, resulting in increased limits and therefore an acceptable noise impact.

Table 3 – predicted noise levels (L_{A90}, dB) at the nearest residential properties.

Name	Easting	Northing	4	5	6	7	8	9	10
Cawburn Shield Farm	372754	568177	19.7	21.5	23.4	25.2	27.0	28.9	30.7
Wealside	373097	568927	19.7	21.5	23.4	25.2	27.0	28.9	30.7
Cowburn Rigg	373641	568279	15.7	17.5	19.4	21.2	23.0	24.9	26.7
Sook Hill	373071	567867	17.2	19.0	20.9	22.7	24.5	26.4	28.2
Edges Green	372323	568733	13.0	14.8	16.7	18.5	20.3	22.2	24.0
Longsyke Farm	373073	568423	33.7	35.5	37.4	39.2	41.0	42.9	44.7

In summary, noise levels predicted in accordance with current good practice from the proposed two R9000 turbines are below the simplified assessment criteria of ETSU-R-97 at all non-involved dwellings. This means that the proposed development complies with the ETSU-R-97 guidelines and there is no need to undertake a baseline noise survey for this application.

Yours sincerely,

Hoare Lea



Matthew Cand
Senior Associate

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- i ETSU-R-97, the Assessment and Rating of Noise from Wind Farms, Final ETSU-R-97 Report for the Department of Trade & Industry. The Working Group on Noise from Wind Turbines, 1997.
 - ii A Good Practice Guide to the Application of ETSU-R-97 for the Assessment and Rating of Wind Turbine Noise, M. Cand, R. Davis, C. Jordan, M. Hayes, R. Perkins, Institute of Acoustics, May 2013.
 - iii Evancewind, Report TR087/5, Product Certification – Evance R9000 Acoustic Noise Assessment