Evoco Energy Evoco 10kW Acoustic Report

Introduction

The Evoco 10kw wind turbine has undergone acoustic testing by an independently accredited testing laboratory (Narec) and independently accredited certification body (BRE Global) in accordance with the BWEA Small Wind Turbine Performance and Safety Standard (2008), a specific implementation of British Standard BS EN 61400-11. Both BRE Global and Narec work under the supervision from Gemserv, the master licensee under the government-mandated Microgeneration Certification Scheme (MCS).

This document presents this independently verified Noise Label and provides and explanation on its use and interpretation.

Noise Label

The noise label for the Evoco 10kw is below in Figure 1. The key results are the Declared Apparent Emission Sound Power Level, $L_{Wd,8m/s}$, at 8m/s hub height wind speed and noise immission predictions for a range of slant distances and hub height wind speeds.

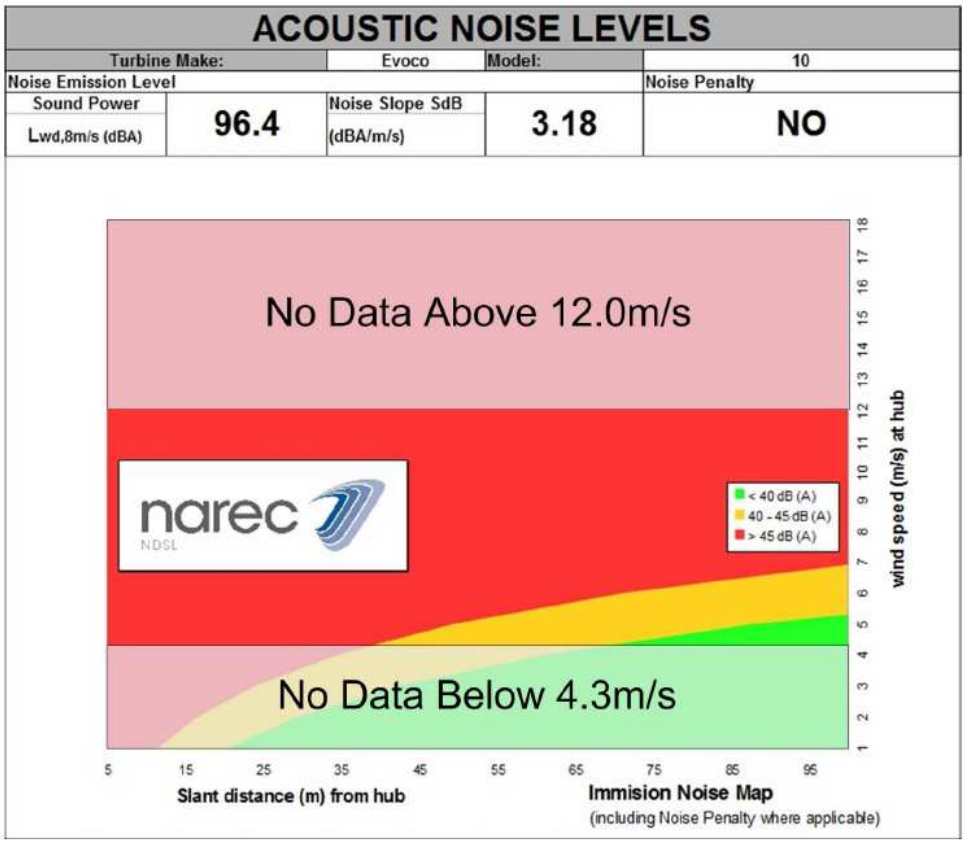


Figure 1

Note that in accordance with section 3.4.15 of the BWEA standard regarding tonal assessment, the Evoco 10kW does not exhibit any tonal quality and therefore no penalty should be applied.

The BWEA Reference Sound Levels at 25m and 60m at an 8m/s hub height wind speed are:

$$L_{p,25m} = 60.5dB \quad (A)$$

$$L_{p,60m} = 52.9dB \ (A)$$

About the Noise Label

The noise label shown in Figure 1 contains a summary of the acoustic measurements performed to the BWEA Small Wind Turbine Performance and Safety Standard (2008). It should be noted that the Immission Noise Map shown in the noise label is only for slant distances up to 100m. This is a requirement of the BWEA standard and is calculated with a high degree of certainty using hemispherical propagation noise modelling.

The general method for assessing the likelihood of wind turbines to cause complaint is to assess the noise level against the World Health Organisation (WHO) community noise guide level i.e. a maximum allowable night-time noise level of 45dB(A). This is the approach specified in the large wind turbine ETSU-R97 method and therefore is similarly followed by the BWEA Small Wind Turbine Standard.

The regions shown in the noise label correspond to this 45dB(A) noise level. Red regions are unlikely to be given planning permission as they exceed the 45dB(A) level. Amber regions fall between 40dB(A) and 45dB(A) and would generally be acceptable depending on local factors. Locations in the Green region fall well below the 45dB(A) level and are highly likely to be acceptable .

As can be seen from Figure 1, the noise label region under 100m is largely red. This means that it will be more usual to be trying to predict noise levels for the Evoco 10 at distances greater than the 100m given in the standard BWEA noise label. At distances over 100m, atmospheric noise propagation effects make predictions more difficult and tend to overestimate the expected noise levels.

Using the Noise Label

The noise immission from a wind turbine rely heavily on local topology, background noise levels and expected wind speeds. This means assessment should usually be done on a site by site basis taking these factors into account.

An estimate of the noise immissions from the wind turbine can be calculated using the method below:

a) Establish 10m altitude mean wind speed for proposed location using the NOABL (Numerical Objective Analysis of Boundary Layer) database. The national database of approximate wind speeds published by the UK government (referred to as NOABL) can be found here:

   http://old.berr.gov.uk/windspeed-database/page27326.html#

   NB. If you have a measured, annualised mean wind speed for the installation site, skip to step d.

b) Use NOABL to get the mean average annual wind at 10m height for the location. $V_{avg,10}$

c) Correct the NOABL wind speed for local topology and wind shadowing effects, as described in MIS 3003 – MCS Micro and Small Wind Standard. An extract from MIS 3003 appears at Appendix 1. This correction should also account for turbine height to give V_e

d) Assume a Rayleigh wind distribution, calculate the 90% wind $V_{90,H}$ as:

$$V_{90,H} = 1.72 \times V_e$$

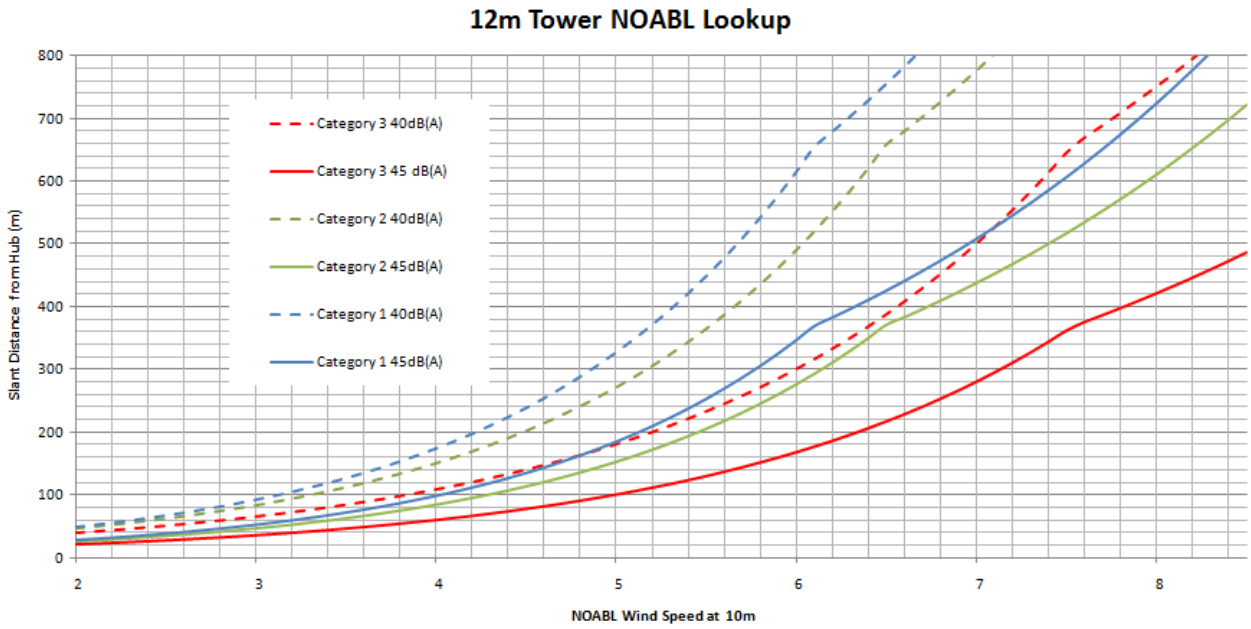
e) Draw a horizontal line on the Emission Noise Map in the BWEA Noise Label at $V_{90,H}$

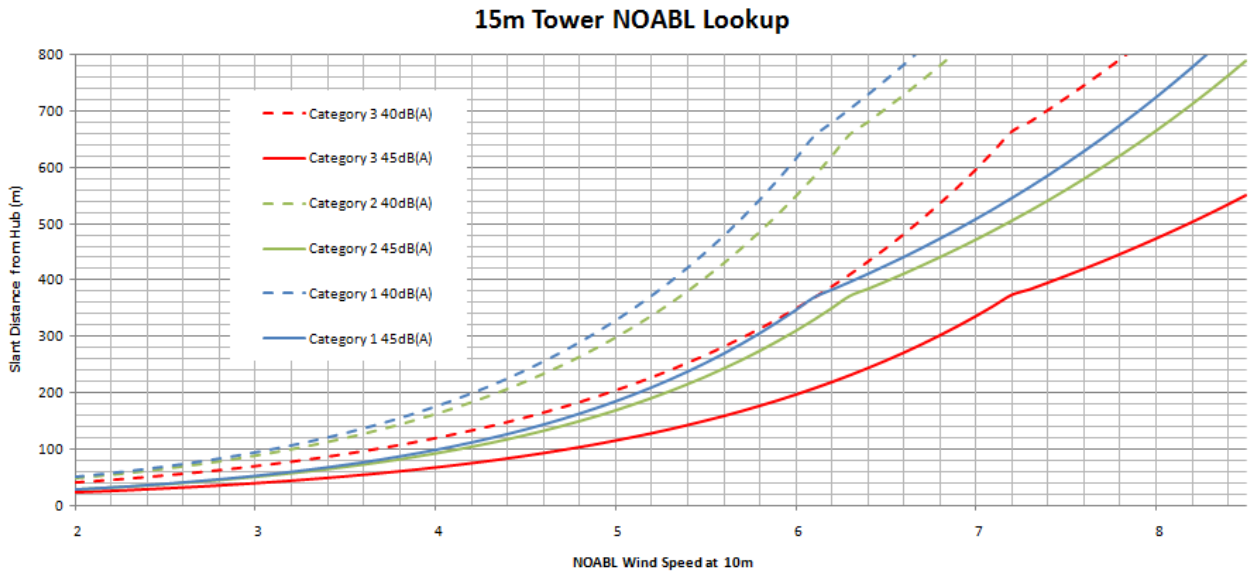
f) Read-off the distance for the acoustic dB(A) values of interest.

g) Compare these distances with the slant distance from the turbine hub to the nearest noise sensitive location(s) for the planned installation.

As previously mentioned the BWEA noise label only shows slant distances up to 100m. To simplify the process above, and provide guidance on distances greater than 100m, Evoco have already carried out the calculation for both the 12m and 15m towers. These can be seen in Figure 2 & 3 and have already been site corrected for Category 1 -3 wind sites, as defined in MIS 3003 installer standard, an extract of which appears at Appendix 1.

The x-axis is the annual mean wind speed at 10m height and can be found from the NOABL database as described above. The graph lines provide the slant distance that is predicted to meet the 45dB(A) or 40dB(A) noise criterion for the wind speed that will be not be exceeded for 90% of the time at a site with the chosen NOABL wind speed level. If using these graphs the calculations and adjustments in the previous section do not need to be performed as these have already been taken into account.





Example Application

"A rural site with very minor obstructions (Category 2) with a NOABL wind speed of 5m/s. The turbine is to be installed on a 12m tower."

Simply look up a NOABL wind speed of 5m/s on the graph shown in Figure 2. Follow this up to the solid green line (45 dB(A) Category 2) and read off the slant distance from the Y axis. This gives a 45dB(A) threshold of approximately 150 meters.

If a 40dB(A) threshold was required this would give a slant distance of approximately 275 meters.

In plain English, this demonstrates that on a site with 5m/s mean wind speed with topography corresponding to the class 2 description, that at a distance of 150m we are 95% certain that the noise level will be lower than 45dB for 90% of the time.

In the language of statistics, a 90% confidence interval (t=1.645) has been applied to the Standard Error of the noise readings and this has been combined with the reading for the wind speed that corresponds to the wind speed on a Rayleigh distribution which represents 90% of the area under the curve (or 90% of the time).

Appendix 1

Site Categories from MIS3003

If these regions include areas described by more than one of these categories then choose the category that is numerically highest:

Category 1: Flat grassland, parkland or bare soil, without hedges and only a few isolated obstructions.

Category 2: Gently undulating countryside, fields with crops, fences or low boundary hedges and few trees.

Category 3: Farmland with high boundary hedges, occasional small farm structures, houses and trees etc.

Category 4: Woodland or low rise urban/suburban areas. (E.g. domestic housing) with a plan area density of up to about 20%.

Category 5: Dense urban areas and city centres. (e.g. buildings of four-stories or higher) with a plan area density of greater than about 20%.

MIS3003 contains scaling factors to take into account the effect of the terrain on the NOABL predicted wind speed.

For the purposes of this report the following factors from this document have been used:

Category 2 Sites:

12m Tower: 0.94

15m Tower: 0.97

Category 3 Sites:

12m Tower: 0.81

15m Tower: 0.85