

I, Mr Barry Steven Crawford, object to the proposed windfarm known as Llanbadarn Fynydd and I wish to give oral evidence at the Powys Conjoined Public Inquiry.

1. INTRODUCTION

1.1 I have lived at the above address with my partner, Miss M L Flanders, since 2007. We bought this property specifically for its quiet rural location with no near neighbours and because of its dark skies. My main occupation is as an astronomer, not only making practical observations but also designing and building astronomical telescopes.

1.2 My main objection to the proposed windfarm is that it will adversely affect our health, well-being and our right to peaceful and quiet enjoyment of our home, as follows:

2. AUDIBLE NOISE FROM TURBINE OPERATION

I am concerned about the level of operational noise from this windfarm because of the following:

2.1 Page 164 of the developer's SEI February 2013 Volume 1-Text, section 4.4 Turbine Specification states that the Vestas V90 3.0MW turbine has been used to determine the likely operational noise-levels. This particular model of turbine has five operating modes (0-4). The predicted sound levels have been measured with the turbine operating in mode 3, i.e. a constrained operating mode as the developer states that alternative operating modes (mode 2 or better) would have resulted in a breach of the ETSU-R-97 guidelines. My question is: what is to prevent the windfarm operators from using mode 2 or better once the windfarm is operational? Will any planning permission that might be granted contain a specific clause stating that use of such modes will be a breach of the planning permission, and if so, how will this be enforced?

2.2 Background Noise Level At Fiddlers Green

2.2.1 Page 158 of the developer's SEI February 2013 Volume 1-Text, Table 4.1 refers. The background noise level at Fiddlers Green has not been physically measured by the developer but has instead been assigned a value derived from measurements taken at Esgairuchaf, which has then been used as a 'proxy location' for my home. When we consider that this proxy location is a working farm, whereas my residence is a quiet retirement home, one must question the validity of choice. Surely, like-with-like would have been more appropriate?

2.2.2 Appendix 1 of my Proof Of Evidence shows the derived background noise levels at Esgairuchaf (the proxy location used for Fiddlers Green) and the actual background noise measurements carried out at my property between 5th May and 2nd June 2011 by Resound Acoustics Ltd on behalf of RWE Npower Renewables for their proposed Neuadd Goch Bank windfarm. Comparison of these two sets of measurements shows a clear disparity between them, with a difference of over 5dB for the daytime amenity period. These two sets of data can't both be right and would lead one to think that only one of them is correct – but which one? Actually, there is another possibility which must be given serious consideration, and that is that both sets of data could be, and in my view, are, wrong. In which case, the determination of the level of background noise at Fiddlers Green remains unknown, therefore this throws into question the whole estimate of the noise levels likely to be experienced by us should this windfarm become operational.

MR B S CRAWFORD PROOF OF EVIDENCE

2.3 Predicted operational noise levels

I am not at all convinced that any reliance can be put on the operational noise levels predicted by Vattenfall. Section 4.1-8 (Propagation of Sound) of Vattenfall's SEI February 2013 Volume 3 – Appendix 3E- 9.1 states that: *There is no wind farm specific British or International Standard which prescribes the method to calculate wind turbine noise emissions. However, it is accepted by UK acoustic consultants that wind farm noise is calculated according to ISO 9613-2. ISO 9613 predicts the equivalent continuous sound pressure level ($L_{Aeq,T}$) under meteorological conditions favourable to propagation from sources of known sound emissions.*” It also states: “... for receptors between 100m and 1km from the source and where the average height of the source and the receiver is between 5-30m, the estimated accuracy of the predictions is +/-3dB. However, outside of these conditions the Standard does not provide any indication of accuracy.”

We therefore have a situation whereby:

- a) there are no actual British or International Standards for calculating wind turbine noise emissions
- b) ISO 9613 provides no indication of accuracy unless the average height of the source and the receiver is between 5-30m. If the ‘source’ refers to the turbine height, then the average height of the turbines proposed for this windfarm is certainly well over 30m (the Vestas V90 candidate turbine has a hub height of 80m). Equally, if the ‘receiver’ is understood to mean a human being, then the height of the average human is well below the 5m designation.
- c) To continue the SEI quote “..outside of these conditions the Standard does not provide any indication of accuracy” In other words, it is virtually impossible to make any fully meaningful prediction as to the actual noise levels to which nearby residents will be exposed.
- d) Further on in this paragraph of the SEI we read “Nevertheless ISO 9613-2 is widely used to predict noise levels from wind turbines and provided appropriate assumptions are made, then realistic estimates of wind turbine noise can be determined” However, the question arises – what would happen if inappropriate assumptions are made? Presumably, an unrealistic estimate of wind turbine noise would result. This leads on to the ultimate question – what degree of accuracy should be afforded to wind turbine predicted noise level estimates by the developer? The answer, I would suggest, is zero.

I am extremely worried that the operational noise generated by this windfarm will have a serious detrimental effect on nearby local residents such as myself and my partner. We specifically purchased our home because of the almost complete absence of man-made noise, and any increase in noise levels, regardless of whether or not these are within ETSU-R-97, would be totally unacceptable to us. We spend much of our time outside on our land, therefore any shielding we would receive within our house (because of being indoors) would be of no benefit whenever we are outside. Even indoors, as our bedroom faces the windfarm site, any noise from the turbine operation would clearly reach us and, I have no doubt at all, make it very difficult for us to sleep. Our situation will be made even worse should any or all of the other three windfarm planning applications currently applied for be granted, and the likely cumulative impact of these must also be taken into account.

3. LOW FREQUENCY NOISE AND INFRASONIC VIBRATION

I am very concerned about the possible adverse effects from low frequency noise and infrasound on the health and well-being of myself and my partner.

3.1 Time after time, we hear and read of the developer's referral to ETSU-R-97 as if it were the final and definitive text on the subject - but how ‘robust’ is it, and is it really ‘fit for purpose’? I would suggest the answer to both these questions are in the negative. ETSU-R-97 excludes the

measurement of low frequency noise and infrasound and purposefully skews the bias towards

MR B S CRAWFORD PROOF OF EVIDENCE

the higher audible end of the sound spectrum, completely ignoring the lower frequencies. Why is this? Could it be that the original ‘architects’ of ETSU, drawn from acoustic experts and windfarm developers with no inclusion of experts from the medical profession, decided that it was ‘inappropriate’ to include the lower frequencies because of the enigmatic nature of low frequency noise and that its consequent inclusion could ‘muddy the water? So, infrasound was ‘out’ and so began the worship of the false idol of ETSU. As Dr Sarah Myhill has elected to cover the health and well-being implications of exposure to infrasound, I shall only briefly make reference to this subject. I refer you to the editorial headed “Wind Turbine Noise” in the British Medical Journal of March 2012 which states: *“A great deal of documentation point to the fact that wind turbines disturb sleep and impair health at distances and external noise levels that are allowed by the authorities in several places, including Great Britain. The sleep problems can be a special problem for children, and it can have significant implications on public health.”*

3.2 Infrasound is a recognised problem for windfarm developers. REG Windpower at their proposed Hallburn Farm site near Longtown, Carlisle, were beset by problems as a direct result of infrasound emission, so much so that their Development Director, Mr Matt Partridge, as quoted in The Guardian newspaper article ‘Windfarms prevent detection of secret nuclear weapon test, says MoD’ by Rob Edwards on 19th August 2011, stated *“We are optimistic there will soon be a solution to the problem”*. In his Report ‘A Review of Published Research on Low Frequency Noise and its Effects’ for Defra, May 2003, Dr Geoff Leventhall clearly states (page 54, 13.2 Effects on Humans) that infrasound is common as an emission from many artificial sources, including wind turbines, and he goes on to say *“The effects of infrasound or low frequency noise are of particular concern because of its pervasiveness due to numerous sources, efficient propagation, and reduced efficiency of many structures (dwellings, walls, and hearing protection) in attenuating low-frequency noise compared with other noise.”*

3.3 We therefore know that wind turbines do generate infrasound, and the British Medical Journal article I refer to above and the submission to this Inquiry by Dr Sarah Myhill clearly demonstrate that infrasound is responsible for causing health issues in human beings. Therefore, if we have wind turbines emitting infrasound, and infrasound causing health issues in humans, it is obvious that windfarms have the potential to adversely affect our health - the link is clear. Renewable UK (formerly The British Wind Energy Association) claim that such comments are based upon work described by them as “unscientific”. For my part, I would rather listen to the opinion of a qualified medical doctor than the pronouncements of ‘spin doctors’ funded by the windfarm industry. Unlike audible noise, low frequency and infrasound emissions cannot actually be heard but instead are experienced as a form of vibration, transmitted through the ground rather than through the air, thus penetrating buildings (such as our house) - they cannot be reduced by installing sound-proofing such as triple-glazing etc and they carry for much greater distances than audible noise. From studies of this subject I have undertaken since 1978, I have learned that as many as one-in-five human beings could be adversely affected by these vibrations, suffering nausea, headaches, sleeplessness etc. Of course, it is impossible to know whether one is likely to be affected until one actually has to live with this phenomenon, but I really do not wish to be forcibly put in the position of having to discover that I or my partner (or both of us) are people susceptible to this problem.

4. SHADOW FLICKER

Shadow flicker resulting from the sun passing behind turbine blades is easily understood and the effects of a rhythmic sweeping of shadows across the landscape, including nearby private residences and its intrusive visibility from inside homes, can easily be imagined, as also can its adverse effect on humans, particularly the danger of it triggering an epileptic fit.

4.1 From my study of the location of three turbines on the Llanbadarn Fynydd site, numbers 17, 16 and 15 (listed in order of potential impact on our home) and from my own research and

MR B S CRAWFORD PROOF OF EVIDENCE

computer-simulated modelling, I am able to state quite categorically that the impact of both flicker and shadow effects on my residence will be extremely significant. Whereas turbine no. 15, only part of which will be visible from here, would produce a short-term and as such, minimal, effect, turbine no. 16, having the hub and blades fully visible, would have a much greater impact, and turbine no. 17, being closer, in full view and a prominent landscape feature, would have by far the greatest impact of all on my home.

4.2 The topography and the position of my residence in relation to turbine no. 17 means that the flicker and shadow effect from this turbine would rate as being very high. There is the potential (given the weather conditions) for shadow flicker to occur from the blades of turbine No. 17 on at least 50 days of the year, with additional days, possibly as many as 25, when flicker from the other two nearby turbines could also occur. Also to be taken into account is the lesser-known phenomenon of specular reflection – while often overlooked, it does have a contributory role to play in the ‘annoyance’ effect whenever large wind turbines are placed in what would otherwise be an unspoilt landscape. As a consequence, this would have a serious health implication for myself and my partner, which would, in my view, be completely and totally unacceptable.

4.3 On occasions the moon will also cause nocturnal shadow and flicker effects. This will undoubtedly act as a contributory factor, together with audible noise and low-frequency vibration, for potential sleep disturbance. For example, at times of full moon the brightness of the moon illuminating the landscape will easily render such sweeping shadows clearly visible through our bedroom windows and would, together with a rhythmic audible pulsation, greatly increase the potential for us to suffer an unacceptable level of sleep disturbance.

4.4 Recommendation – turbine no. 17 has to be completely removed from the proposed windfarm scheme and turbines no. 16 and 15 must be located further away from my residence, at a minimum distance of 2.5km.

5. CONCLUSION

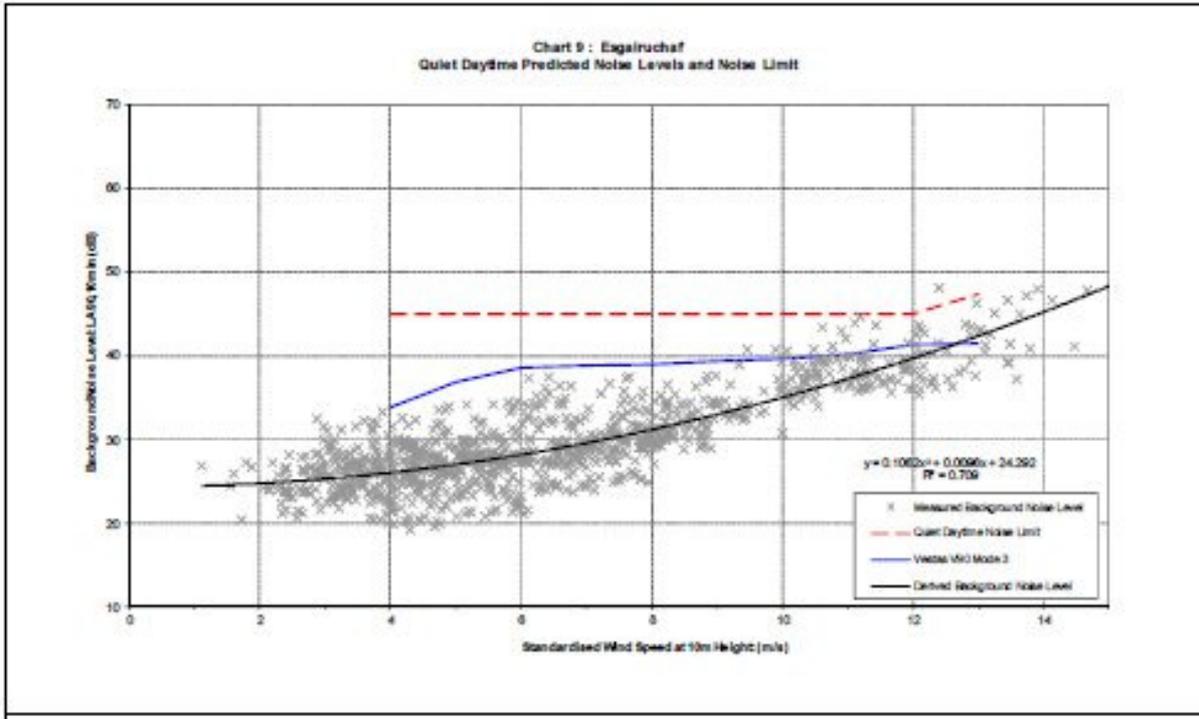
In conclusion, I have to ask what faith or trust can be given to the methods employed by the developer to determine whether the noise (both audible and low frequency) generated by this windfarm, and any others built in our locality, will be of an acceptable level for people living in nearby residential properties. The answer, from my perspective, is simple – no faith and, certainly, no trust, in the claims of facts and figures made by the developer on the issue of noise and in particular low frequency noise/infrasound vibration.

I therefore strongly urge The Inspector to recommend refusal of planning consent for the proposed Llanbadarn Fynydd windfarm.

I reserve the right to amend or add to this Proof Of Evidence, should further information come to light between the date of my submitting it and the date of my formally presenting it to the Public Inquiry Hearing.

Attachment

Appendix 1



Vattenfall SEI February 2013, Volume 3 – Appendix 3E – 9.1, section 4.5-6

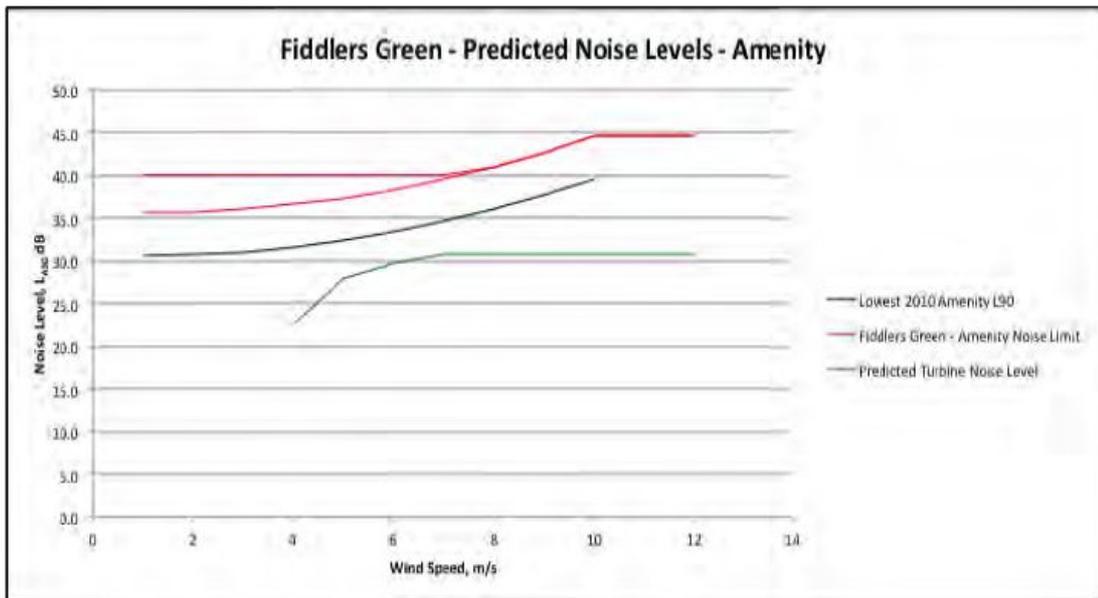


Figure 16.10.5: Predicted Noise Levels – Fiddlers Green – Amenity Period

RWE npower renewables - Neuadd Goch Bank windfarm ES Appendix 16 – Noise Part 3