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RENEWABLE ENERGY FOUNDATION

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NEW RESEARCH EXPLAINS WIND TURBINE NOISE PROBLEMS

In a major new article published this month in the *Journal of Sound and Vibration*,[1] G. P. Van den Berg, a physicist at the University of Groningen in the Netherlands,[2] believes that he has at last explained the mystery of why modern onshore wind turbines can cause noise problems for residents at distances of a mile or more.

For his article, "Effects of the wind profile at night on wind turbine sound" (*Journal of Sound and Vibration*, 277 (2004), 955–970), Van den Berg measured sound around the Rhede wind-farm (an installation of 17 turbines), on the Dutch/German border. "Residents living 500 m and more from the park have reacted strongly to the noise; (and) residents up to 1900m distance expressed annoyance" particularly at night. Yet, conventional wind industry calculations have assumed that turbines would present no noise problem over 500m.

After extensive measurements, Van den Berg discovered that the methods used by wind turbine developers, in the UK and elsewhere, to predict noise are seriously flawed because of their assumption that wind speeds measured at a height of 10 metres are representative of wind speed at the greater heights of modern turbines (often 100 metres and above).

The importance of this analysis is further exacerbated when measured at night, when though wind speeds may fall at ground level (to near zero), they remain fast enough at 60 metres (and above) to turn the turbine blades. In fact, his measurements show, wind speeds at night are up to 2.6 times higher than expected.

Even in the day background noise is not good at covering the rhythmical thumping caused by the blade as it passes the tower. Consequently, against expectations, the turbines were turning at night and the noise propagating down into an area at ground level where this was no background noise to mask it, and consequently residents were experiencing sound levels 15dB higher than expected. Though turbines were making as much noise as normal, it was carrying much further, and especially at night when it was particularly troublesome. Fascinatingly, Van den Berg has found that the error is smallest within 400m of the turbine but is much greater at distances up to a mile away.

Van den Berg concludes, "The number and severity of noise complaints near the wind park are at least in part explained by the two main findings of this study; actual sound levels are considerably higher than predicted, and wind turbines can produce sound with an impulsive character."

"The relatively high wind speeds at turbine hub height at night also have a distinct advantage; the electric power output is higher than predicted and benefits the operator of the wind turbine."

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[1] www.elsevier.com/locate/jsvi

Van den Berg also believes that infrasound is very probably a significant feature in the audible noise problem. [3]He has pointed out that although inaudible, the low blade passing of wind turbine blades, frequency modulates clearly audible higher frequency sounds and thus creates periodic sound (with the effect strengthened at night). Further he observes that groups of several turbines can interact to amplify this effect. The Renewable Energy Foundation (REF) has commissioned G. P. van den Berg to produce further research.

CEO Campbell Dunford, commented, "As Van den Berg has said, we are all very much in favour of renewable energy, but it is extremely important that the truth about any turbine noise problems is made public. Many developers are currently proposing putting substantial groups of large turbines within 500m of residential areas. Experiences across Europe suggest that there are problems with turbine noise, and Van den Berg's recent work offers some possible explanations. This is important and should be investigated further as a matter of urgency."

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[3] At the 11th International Meeting on Low Frequency, Noise and Vibration and its Control (*Maastricht,*