

Wind turbine syndrome: infrasound and fury
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Impact on People Noise

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When Janet Hetherington went to a Melbourne hospital for a minor procedure late last year she had an odd experience. She was unable to sleep in the bed she was given and forced to move to escape a disturbing sensation that made it impossible for her to settle.

She reported her incident to hospital authorities, who later called in acoustic experts who confirmed a concentration of low-frequency noise in the precise area that she had been settled. The noise has not affected everyone who has used that bed and, rather than do anything about the source, hospital staff have been told to be on the lookout for anyone who may experience a similar reaction.

Hetherington's hospital experience is especially interesting as she has lived at Macarthur in southwest Victoria, home to one of the country's biggest wind farms.

Disturbance from low-frequency noise from industrial air conditioning fans and compressors is pretty normal stuff in big buildings, and Victorian and Queensland health departments documents recognise that low-frequency noise sensitivity and sensitisation can be a problem for some people.

Hetherington's hospital experience is another chapter in an ongoing saga for Macarthur wind farm owner AGL and the wind industry globally, which many say has been forced to jump at shadows on the issue for the past two decades. [See Hetherington's letter to AGL: "My 101st formal complaint to AGL".]

Hetherington now has left the Macarthur area and says her sleep and health are greatly improved.

As the number of wind farms increases around the world, the number of complaints also is rising, as are the cases for noise nuisance being settled by wind power developers – the latest being last month in the Irish High Court, where a German wind power operator admitted liability but settled before the issue of punitive damages was determined by the court [link].

What has been dismissed by some leading commentators as an imaginary ailment is of increasing concern in medical circles internationally and acoustic specialists are investigating whether there is a physical explanation for what is going on.

The French Academy of Medicine has published a position paper on the issue that found the noise from wind turbines represents an "existential suffering" and real threat to the quality of life of nearby residents that must be taken seriously [link]. After an investigation of the scientific literature, the academy did not reach a conclusion on the cause of widespread complaints about a so-called wind turbine syndrome. But it said even if wind turbines did "not seem to directly induce organic pathogens, it affects through its noise and especially visual nuisance the quality of life of a part of the residents" and thus their "state of complete physical, mental and social

well being which today defines the concept of health”.

The academy recommended new wind turbines be built only “in areas where there was consensus among the population concerned as to their visual impact”, and a system of ongoing noise checks with a reduction in allowable noise limits to a weighted 30 decibels (30dBA) for outside dwellings and 25 decibels inside. It also repeated an earlier call for an epidemiological study on health nuisance from wind turbines.

Wind turbine syndrome symptoms cover a wide spectrum of disorders including sleep loss, fatigue, nausea, headaches, tinnitus, disturbances of balance, dizziness, stress, depression, irritability, anxiety, perturbed steroid hormone secretion, hypertension and socio-behavioural changes.

“At the medical level, wind turbine syndrome produces a complex and subjective entity in the clinical expression of which several factors are involved,” the French academy report says. Analysis of the medical and scientific literature did not show that wind turbines had a significant impact on health.

“In other words, no disease or infirmity seems to be imputable to their functioning,” the academy says. “The problem, however, is that the definition of health has evolved and that, according to World Health Organisation, it now represents a state of complete physical, mental and social wellbeing, not merely the absence of disease or infirmity.”

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Much attention has been put on the possible role of low frequency or infrasound below the threshold of hearing. Australian researchers at the University of Sydney-affiliated Woolcock Institute of Medical Research are working with acoustics experts to test surrounding inaudible, or infrasound, noise attributed to wind turbines. However, the study is using synthesised “infrasound” and not that actually generated by wind turbines.

A sample of 40 people who are prone to being disturbed by noise will face three weekends in a purpose-built laboratory being exposed to silence, traffic noise and synthesised wind turbine infrasound. The researchers will monitor their health throughout the experiment, especially as they sleep. Results will be available in about 2020, but there is intense debate about whether wind turbine sound can be adequately replicated in the laboratory for such experiments.

The Swedish study, *Physiological Effects of Wind Turbine Noise on Sleep*, reported in September last year to the International Congress on Acoustics, highlights the importance of the pulses of noises made by rotating wind turbine blades that lead to a variation in the sound level. This variation in the sound level is described as amplitude modulation and can vary from inaudible to clearly audible.

“The presence of beats and strong amplitude modulation contributed to sleep disturbance, reflected by more electrophysiological awakenings, increased light sleep and wakefulness, and reduced REM and deep sleep,” the study says.

“The impact on sleep by these acoustic characteristics is currently the focus of interest in ongoing studies.”

Four of the world’s leading acoustic experts working on a joint paper have suggested two simple

experiments that may resolve many of the issues.

The research can be traced back to work conducted by Steven Cooper in 2015, commissioned by wind developer Pacific Hydro, into noise emitted from its Cape Bridgewater wind farm in Victoria [\[link\]](#).

The latest paper includes contributions from the industry doyen of wind farm noise, Geoff Leventhall, and Paul Schomer, chairman of the American National Standards Committee dealing with noise. The researchers agree that “infrasound from wind turbines can almost be ruled out as a potential mechanism for stimulating motion sickness symptoms”. But they recommend “two relatively simple and relatively inexpensive studies be conducted to be sure no infrasound pathways to the brain exist other than through the cochlea”. The tests involve asking residents to identify when wind turbines are being turned on and off.

Residents’ responses also would be measured in relation to changes in the amount of electric power being generated by operating wind turbines.

The wind industry has been reluctant to co-operate with these sorts of investigations in the past. However, Australia’s meticulous records of power generation for the National Electricity Market may provide a solution.

The proposed tests stem from findings of Cooper’s Cape Bridgewater research in which affected residents were asked to keep diaries of their experience, which later were compared to wind farm operation. Cooper found the study participants responses correlated better to the electric power being generated rather than to the acoustic signal. It suggests that people may be affected more by the speed of the wind turbine operations when depowering the turbine and to large changes in the electric power being generated.

“The fact that the subjects’ responses correlated with electric power, which is something the subjects could have no way of knowing, lends strong support to Cooper’s findings,” Schomer says.

Schomer says the suggested new tests are important for two reasons.

First, the subjects are incapable of having detailed knowledge of the electric power being generated. Second, if true, it is something that is potentially correctable by the wind industry through changes to blade design and operation.

Acoustician George Hessler says for a very small change in sound level generated by the wind turbine, there can be a very large change in the electric power generated.

Other research suggests a source of low-frequency audible sound is produced each time a blade passes the support tower.

The wind turbine blades flex so that the blade tip comes closer to the support tower as the electrical power being generated increases. The reverse occurs as the power being generated decreases.

“The facts in this analysis indicate that this should be studied further, since this may be an important factor in the community response – both annoyance and other physiological effects,” Schomer says.

“The fact that this sound source can be controlled by the operator, to some degree, gives some promise to our ability to mitigate or eliminate this problem.”

The collective conclusion of researchers has been that none of the opinions and recommendations answers the posed question – does low-frequency noise from wind turbines

disturb people's sleep or make people sick?

"It is abundantly obvious that intense adverse response occurs at certain sites," they say.

"Realistically it is not even possible to answer the posed question to all parties' satisfaction without practical research."

But they argue the wind farm industry must accept that there are enough worldwide sites that emit excessive wind turbine noise resulting in severe adverse community reactions to adopt and adhere to policies setting out a reasonable sound level limit.

Likewise, wind farm opponents must accept reasonable sound limits or buffer distance to the nearest turbine.

Leventhall says stress from wind turbines, if it arises, is normally low level but, in a very small number of people, it may become intense and overpowering so that opposition to wind turbines is the dominating emotion in their lives.

He says research has shown reaction to noise, especially low-level noise, is largely conditioned by attitudes to the noise and its source.

"Persistent repetition that infrasound from wind turbines will cause illness develops stressful concerns in residents, but repetition is neither evidence nor proof," Leventhall says.

He cites concerns on inaudible infrasound from current designs of wind turbines began 10 to 15 years ago, linked to objections to the growth of wind farms, and has accelerated during the past five to 10 years.

"It is inevitable that, in the absence of good supporting evidence, these speculative claims will become discredited over the next five to 10 years," Leventhall says.

Australian researcher Cooper is focusing his continuing research on infrasound and amplitude modulation, highlighted also by the Swedish research.

In a paper presented to a congress on Noise as a Public Health problem in Zurich two weeks ago and at the Acoustical Society of America conference in Boston last week, Cooper says his research finds "modulation of low-frequency noise at an infrasound rate that occurs at or near the threshold of hearing may lead to a trigger response in individuals".

In other words a mechanical cause for some people's complaints may have been identified that is more complex than simply very low frequency noise.

If Cooper's research is correct, the industry may have some new clues on how to fix a problem that has raised intense passions and caused a good deal of concern around the world.