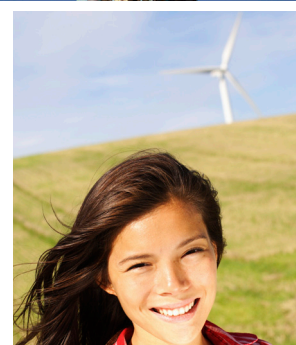


## Wind Turbines and Health



**W**ind power has been gaining prominence as a viable sustainable alternative to other forms of energy production. Studies have found that there is increasing population demand for 'green' energy<sup>1,2</sup>. In Australia, this has been encouraged by the introduction of the Renewable Energy (Electricity) Act in 2000 and the Renewable Energy Target Scheme in 2009.

As with any new technology, wind turbines are not without controversy. Those who oppose the development of wind farms contend that wind turbines can adversely impact the health of individuals living in close proximity.

### Do wind turbines impact on health?

Concerns regarding the adverse health impacts of wind turbines focus on infrasound noise, electromagnetic interference, shadow flicker and blade glint produced by wind turbines.

While a range of effects such as annoyance, anxiety, hearing loss, and interference with sleep, speech and learning have been reported anecdotally, there is no published scientific evidence to support adverse effects of wind turbines on health.

Reported health concerns primarily relate to infrasound (sound that is generally inaudible to the human ear) generated by wind turbines. The World Health Organization states that 'There is no reliable evidence that sounds below the hearing threshold produce physiological or psychological effects'<sup>3</sup>. A recent expert panel review in North America found no evidence that audible or subaudible sounds emitted by wind turbines have any direct adverse physiological effect<sup>4</sup>. The principal human response to perceived infrasound is annoyance<sup>5</sup>.

A study of three UK wind farms also supports this conclusion, finding that sound associated with modern wind turbines is not a source which will result in noise levels which may be injurious to the health of a wind farm neighbour<sup>6</sup>. However, there is also the argument that if people are worried about their health they may become anxious, causing stress related illnesses which are genuine health effects arising from their worry, but not from the wind turbine itself. For this reason, NHMRC recommends that people who believe they are experiencing any health problems should consult their GP promptly.

The situation is further complicated by findings that people who benefit economically from wind turbines were less likely to report annoyance, despite exposure to similar sound levels as people who were not economically benefiting<sup>2</sup>.

There is currently no published scientific evidence to positively link wind turbines with adverse health effects.

### Inside

Do wind turbines impact on health?

How much sound do wind turbines produce?

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## How much sound do wind turbines produce?

Sound is composed of frequency expressed as hertz (Hz) and pressure level expressed as decibels (dB). Human sensitivity to sound is variable and people will exhibit variable levels of tolerance to different frequencies, including those below the normal range of human hearing<sup>7</sup>.

Noise can be defined as any undesirable or unwanted sound. The perception of the noise is influenced by the attitude of the hearer towards the sound source<sup>7</sup>. A recent study found that noise annoyance was strongly associated with a negative attitude to the visual impact of wind turbines on the landscape<sup>2</sup>.

Table 1 compares the noise produced by a ten turbine wind farm compared to noise levels from some selected activities.

Activity	Sound pressure level (dBA*)
Jet aircraft at 250m	105
Noise in a busy office	60
Car travelling at 64kph at 100m	55
<b>Wind farm (10 turbines) at 350m</b>	<b>35–45</b>
Quiet bedroom	35
Background noise in rural area at night	20–40

Based on these figures noise levels from wind turbines have been assessed as “negligible”, that is, they appear to be no different to that found in other everyday situations<sup>9</sup>. Further, a survey of all known published results of infrasound from wind turbines found that wind turbines of contemporary design, where rotor blades are in front of the tower, produce very low levels of infrasound<sup>10</sup>.

## Are there other features of wind turbines that may have effects on health?

It has been suggested that phenomena such as shadow flicker and blade glint could have effects on health. Shadow flicker describes the flicking on and off of the wind turbine’s shadow as the blades rotate<sup>1</sup>. The primary concern with shadow flicker is the potential to cause epileptic seizures. The evidence on shadow flicker does not support a health concern<sup>1</sup>.

Blade glint happens when the surface of wind turbine blades reflects the sun’s light<sup>11</sup>. All major wind turbine blade manufacturers coat their blades with a low reflectivity treatment which prevents reflective glint from the surface of the blade. The risk of blade glint from modern wind turbines is considered to be very low<sup>11</sup>.

There has been some concern about electromagnetic radiation from wind turbines however the closeness of the electrical cables counters the electromagnetic field, as does shielding with metal armour<sup>12</sup>.

Concerns regarding the adverse health impacts of wind turbines focus on infrasound, electromagnetic radiation, shadow flicker and blade glint produced by wind turbines, as discussed above. While there is currently no evidence linking these phenomena with adverse health effects, the evidence is limited.

Therefore it is recommended that relevant authorities take a precautionary approach and continue to monitor research outcomes. Complying with standards relating to wind turbine design, manufacture, and site evaluation will minimise any potential impacts of wind turbines on surrounding areas<sup>13</sup>.

\* The “A” represents a weighting of measured sound to mimic that discernable by the human ear, which does not perceive sound at low and high frequencies to be as loud as mid range frequencies<sup>8</sup>.

## References

- <sup>1</sup> Chatham-Kent Public Health Unit (2008). *The Health Impact of Wind Turbines: A Review of the Current White, Grey, and Published Literature*. Chatham-Kent Municipal Council, Chatham Ottawa.
- <sup>2</sup> Pederson E and Persson Waye K (2007). Perception and annoyance due to wind turbine noise – a dose-response relationship. *Journal of the Acoustical Society of America*, 116(6): 3460-3470.
- <sup>3</sup> Berglund B and Lindvall T (1995). Community Noise. *Archives of the Center for Sensory Research* 2(1).
- <sup>4</sup> Colby DW, Doby R, Leventhall G, Lipscomb DM, McCunney RJ, Seilo MT, and Søndergaard B (2009). *Wind Turbine Sound and Health Effects – An Expert Panel Review*. Prepared for the American Wind Energy Association and the Canadian Wind Energy Association.
- <sup>5</sup> Rogers, A; Manwell, J and Wright, S (2006). *Wind turbine acoustic noise: A white paper prepared by the Renewable Energy Research Laboratory, Department of Mechanical and Industrial Engineering, University of Massachusetts*.
- <sup>6</sup> Department of Trade and Industry UK (DTI) (2006). The measurement of low frequency noise at three UK wind farms: URN No: 06/1412 issued by the DTI in July 2006.
- <sup>7</sup> Minnesota Department of Health (2009). *Public Health Impacts of Wind Turbines*.
- <sup>8</sup> Australian Wind Energy Association (AusWEA) (nd.a): *Wind Farms and Noise*, Fact Sheet No. 6.
- <sup>9</sup> Macintosh A and Downie C (2006). *Wind Farms: the facts and the fallacies*. The Australia Institute: Discussion Paper No. 91.
- <sup>10</sup> Jakobsen J (2005). Infrasound Emission from Wind Turbines. *Journal of Low Frequency Noise, Vibration and Active Control*, 24(3): 145-155.
- <sup>11</sup> Environment Protection and Heritage Council (EPHC) (2009). *National Wind Farm Development Guidelines - Public Consultation Draft*. Commonwealth of Australia; Adelaide.
- <sup>12</sup> Australian Wind Energy Association (AusWEA) (nd. b): *Wind Farming, Electromagnetic Radiation & Interference*, Fact Sheet No. 10. Sustainable Energy Australia.
- <sup>13</sup> Sustainable Energy Authority Victoria (2003). *Policy and planning guidelines for development of wind energy facilities in Victoria*. Sustainable Energy Authority Victoria, Melbourne.