

Utility Scale Wind Energy and Sound

Virtually everything with moving parts will make some sound; wind turbines are no exception. However, well-designed utility scale wind turbines are generally quiet in operation.¹ It is nearly always possible to have a normal conversation at the very base of an operating wind turbine.

The sound heard from wind turbines at a distance, as with other local sources of sound, is affected by many factors – including the wind direction, meteorological conditions, vegetation and other barriers. Site-specific acoustic models can anticipate sound levels at nearby receptors for consideration during project siting.²

**FOR MORE INFORMATION,
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Wind Energy, Sound, and Science

In 2009, the American Wind Energy Association (AWEA) and the Canadian Wind Energy Association (CanWEA) established a multidisciplinary scientific advisory panel comprising medical doctors, audiologists, and acoustical professionals to review current literature available on the perceived health effects of wind turbines. The panel, whose findings were published at the end of 2009, concluded that wind turbine sounds are not unique. Based on the levels and frequencies of the sounds, the panel found no reason to believe that turbines could plausibly have direct adverse physiological effects. The full report can be found at http://awea.org/_cs_upload/learnabout/publications/5728_1.pdf

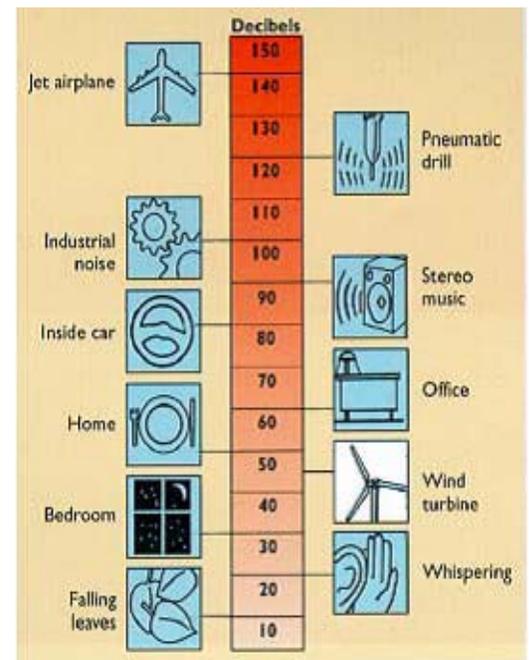
Wind plants are generally quiet

Wind plants are always located where the wind speed is higher than average, and the background sound of the wind itself will often "mask" any sounds that might be produced by operating wind turbines – especially because the turbines only run when the wind is blowing.

The basics of sound

People perceive sounds through sensations in the ear that are caused by pressure variations. Sounds can be distinguished by a loudness (sound pressure) component, measured in decibels, and a frequency component, measured in Hertz. Sound pressure measurements that are weighted to how humans perceive them are called A-weighted and are denoted by the unit dB (A).

The graph shows the decibel level of common sounds, including wind turbines. In the range of 35 to 45 dB (A), at a distance of 350 meters, sound produced by wind turbines is similar to the background sound found in a typical home.



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The source of wind turbine sounds

The sounds emitted from wind turbines can be mechanical, from internal equipment such as the gearbox or yaw drive, or aerodynamic, from air moving past the rotor blades. Current turbine designs effectively reduce mechanical sound through soundproofing; therefore, the aerodynamic sound, often described as a “whooshing” sound, is what can normally be heard. The aerodynamic noise is present at all frequencies, from the infrasound range over low frequency sound to the normal audible range.

Advisory Panel Findings

The scientific advisory panel that addressed wind turbine human health concerns came to the following conclusions:

- Sub audible, low frequency sound and infrasound from wind turbines do not present a risk to human health.
- Sound from wind turbines does not pose a risk of hearing loss or any other adverse health effect in humans.
- Some people may be annoyed at the presence of sound from wind turbines. Annoyance is not pathological.
- A major cause of concern about wind turbine sound is its fluctuating nature. Some may find this sound annoying, a reaction that depends primarily on personal characteristics as opposed to the intensity of the sound level.²

Other sounds associated with wind farms

Along with the minimal operational sounds produced by wind turbines, the actual construction of a wind farm can create sounds. The turbine components are brought to the site on large trucks, and heavy equipment is required to install the turbines. Cranes are used to assemble the turbine components, cement mixers are required to lay the foundation and some earth moving activities may also be required for the turbine foundations. However, the construction phase of a wind farm generally only lasts a few months and these activities can be performed during regular business hours to prevent unnecessary disturbance.

The level of sound allowed from a wind farm is determined by local ordinance

Permitted sound levels are determined at the local level. All wind farms must comply with sound ordinances of applicable local governments prior to project approval. Further, the federal Bureau of Land Management recommends initial comparisons of the existing ambient sound at the site to the expected sound levels generated by a wind project. Expected sound levels are dependent on many factors, such as topography and vegetation, and therefore will vary for each project.³ Thousands of wind turbines have been installed around the world, many in close proximity to other types of land use, with minimal sound issues. The wind industry seeks to be a good neighbor and continues to address concerns regarding wind turbines and sound. Properly sited wind farms benefit communities as a local and renewable energy source and any sound concerns can usually be satisfactorily resolved.

¹ The Scottish Office, Environment Department, Planning Advice Note, PAN 45, Annex A: Wind Power, A.27. Renewable Energy Technologies, August 1994. Cited in "Noise from Wind Turbines," British Wind Energy Association, <http://www.bwea.com/pdf/noise.pdf>.

² Wind Turbine Sound and Health Effects – An Expert Panel Review. 2009, http://www.awea.org/policy/regulatory_policy/documents/AWEA_and_CanWEA_Sound_White_Paper.pdf

³ Bureau of Land Management. (2005). Final programmatic impact statement on wind energy development on BLM-administered lands in the western United States.