

# Utility Scale Wind Energy and Sound



## 20% Wind Energy and Climate Change

As America and the world grapple with the immense problem of climate change, one energy source stands out as an abundant, affordable and readily available supply option: wind power. The U.S. Department of Energy's *20% Wind Energy by 2030 Technical Report* ([www.20percentwind.org](http://www.20percentwind.org)) finds that wind power can supply 20 percent of America's electricity by 2030 and reduce projected emissions of carbon dioxide (CO<sub>2</sub>), the leading greenhouse gas, by 25 percent.

This fact sheet is one in a series aimed at informing decision-makers and the public about this critically important option for America's energy future and countering persistent myths about wind energy.

Virtually everything with moving parts will make some sound and wind turbines are no exception. However, well-designed utility-scale wind turbines are generally quiet in operation and the sound from such turbines is very low compared to that of road traffic, trains, aircraft and construction activities.<sup>1</sup>

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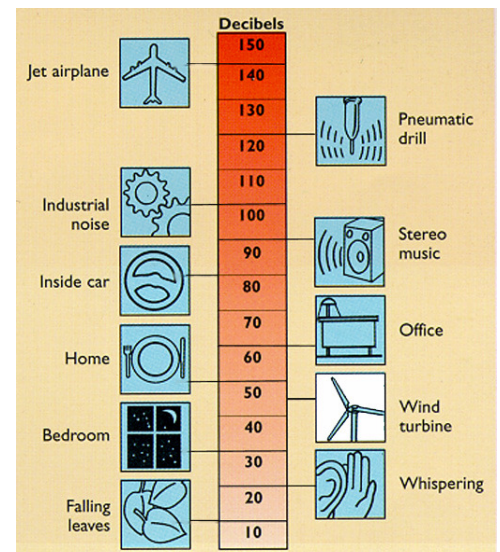
## Wind plants are generally quiet

Wind plants are very, very quiet compared to other types of industrial facilities, such as manufacturing plants. However, most industrial plants are not located in rural or low-density residential areas, where background noise tends to be lower than in urban areas. On the other hand, wind plants are always located where the wind speed is higher than average, and the "background" sound of the wind tends to "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.



### **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 sound proofing; therefore, the aerodynamic sound, often described as a “whooshing” sound, is what can normally be heard.

### **There is no reliable evidence that low-frequency sound from wind turbines is a problem**

Low-frequency sound is generally defined as frequencies between 10 Hz (Hertz, oscillations per second) and 100 Hz. This type of sound has many sources, such as machinery, transportation or the ocean, and is generally always present as an element of background noise. Infrasound is considered to be frequencies below 20 Hz and can be perceived at frequencies as low as 2 Hz. According to a peer-reviewed article in *Canadian Acoustics*, “there is no reliable evidence that infrasound at levels below its hearing threshold has an adverse effect on the body” (p.30) and “infrasound from wind turbines is below the audible threshold and of no consequence” (p.34).<sup>2</sup> The aerodynamic “whooshing” sound described above is not low-frequency sound or infrasound.

### **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 will be brought to the site on large trucks and heavy equipment is required to install the turbines. Cranes will be used to assemble the turbine components, cement mixers will be 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.<sup>3</sup>

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.

<sup>1</sup> 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.britishwindenergy.co.uk/ref/noise.html>.

<sup>2</sup> Leventhall, G. (2006). Infrasound from wind turbines – Fact, fiction or deception. *Canadian Acoustics*, 34(2), p.29-36.

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