

# Who Has Heard The Wind

Jules Smith

Standing in a home a kilometer away from the nearest wind turbine -- one of seventeen at the Pubnico Point Wind Farm in Yarmouth County, Nova Scotia -- Tony experiences a sensation that he describes as "similar to being close to a high power car audio sound system playing drums. Both situations cause problems that I would say resemble arrhythmia."

Wind farms have obvious advantages over more conventional power sources. Unlike nuclear reactors, there's no radioactive waste to dispose of, no risk of catastrophic meltdown. Unlike coal-fire plants, there are no greenhouse gases to choke the atmosphere, no open-pit mines scarring the countryside. And unlike hydro plants, there are many more suitable locations compared to the relatively few available for dams.

Yet, no system is perfect.

One potential problem associated with wind power is noise, like that experienced by Tony. In some locations, residents living near wind farms find the sound to be an annoyance. A few, reporting acute and persistent health problems, have abandoned their homes, unable to sell them.

But are the reported problems justified? If they are, what's causing them? And what can be done to solve them, or at least to prevent them in the future?

## Different Kinds of Noise

The study of acoustics is a complex science, but we can simplify the issue at hand to address a few major components that affect the perception of noise. One is the pressure of the sound, typically measured in decibels.

Stand next to a large turbine turning in a strong breeze and you'll likely hear little more than a gentle whoosh with each rotation of the blades, and perhaps a buzz from the gearbox and the generator. In all, it's not much louder than the wind in the trees. Even at a wind farm consisting of dozens of turbines, the audible noise level is usually much less than that from other commercial or industrial facilities. If the farm is near a major roadway, the traffic noise will probably drown out anything you hear from the turbines. Wind speed and direction also play a role; if the wind is blowing toward you and is very strong, the noise will be louder.

To put some numbers to it, a study by the British Wind Energy Association (<http://www.bwea.com>) reported that the sound from a wind farm 350 meters away (a typical setback distance) was less than that of an automobile moving at 65 km/h a hundred meters away.

A second component to consider is frequency.



Sound, like light, can be described by a spectrum. In the middle of the spectrum we have audible sound, that which most people can hear, in the range of 20 to 20,000 Hz. Above this is ultrasound, like that produced by a bat's echolocation system. Below the audible range is infrasound.

It is this low-frequency sound that seems to cause most of the complaints about noise. Higher frequency sound in the audible range drops off quickly as the distance increases. Lower frequency sound travels further.

But how can noise you can't hear hurt you?

## Wind Turbine Syndrome

Symptoms reported by some residents near wind farms include sleep disorders, headaches, dizziness, nausea, tinnitus, and even the arrhythmia Tony experienced. Some physicians group these under the label Wind Turbine Syndrome.

Like most maladies that acquire the "syndrome" label, a degree of controversy surrounds this condition. Exact causes are not always clear. In some cases where residents have claimed to be bothered by audible noise from nearby turbines, sound measurements have indicated little or no noise above normal background levels. There may be no measurable levels of infrasound either.

Of course it is possible that those reporting the symptoms of Wind Turbine Syndrome are more sensitive to sound and vibration than most people, or even than detection instruments.

It's also possible that other factors are at work. Could the illness be, to some extent, psychosomatic in nature? Attitude clearly influences how our bodies handle stress. Hugh Piggott, editor of the Scoraig Wind Electric site (<http://www.scoraigwind.co.uk>) comments, "Experience has shown that the degree of irritation or pleasure derived from the odd little noises made by wind turbines depend to a large extent on the perceived benefits therefrom. ... Noise is one of the few byproducts of wind energy production. For some it is music and for others it is not."

Whether the underlying cause is psychosomatic or not doesn't change how sufferers feel. Their symptoms certainly are real. And if noise from turbines is the cause, it should be addressed.

### **Better Designs, Better Locations**

As with any technology, designs usually improve over time. This is true of wind turbines. The BWEA study mentioned earlier noted that older turbine designs often placed the blades downwind of the tower. As wind passed the tower it created turbulence that interacted with the passing blades, causing a low frequency pulse. Newer designs place the blades upwind of the tower and increase the distance between the blades and the tower, reducing interaction between the two, further minimizing noise generation.

Other innovations have been introduced as well. Norm Kienitz, President of Cape Breton Power Limited in Nova Scotia (<http://www.capebretonpower.com>) explains, "More advanced blade designs are more efficient and less noisy. Most modern utility scale wind turbines are pitch controlled rather than stall controlled, this is often (but not always) less noisy. Finally, there is a trend toward direct drive machines, which are typically quieter through variable speed operation, fewer mechanical components and especially no gearbox."

Since even the most sophisticated turbine design will still produce some noise and vibration, it's important to situate turbines, and especially large scale wind farms, a suitable distance from residential areas. How far is a matter of debate. Some groups have proposed measurements based on multiples of the length of the turbine blades, while others suggest fixed distances ranging from 300 meters to 2500 meters. Still others insist that wind turbines should only be placed off-shore, but that would severely limit the number of available sites and present other obstacles including access to transmission lines and interference with shipping lanes. A more objective approach would necessitate a detailed site survey taking into account the local terrain, predominant wind speed and

direction, existing noise levels, and the proposed turbine design.

Cape Breton Power Limited employs this approach before implementing a new project. In addition to choosing sites carefully and applying reasonable setback distances, they also conduct ambient noise studies to assess for impact before it occurs. As Kienitz notes, "These types of problems are easier to prevent than to cure."

Still, there are other considerations. Kienitz goes on to explain. "Proximity to residences often influence turbine location, but this also needs to be considered in the project milieu: access to the grid, availability of infrastructure and access, environmental concerns, wind resource, and geotechnical issues."

That may mean that an otherwise ideal location for a wind farm will be close to some residential neighbors. At some point proceeding with a wind farm may mean accepting the fact that it's impossible to please everyone.

### **Accepting a Compromise**

No solution is perfect, so if we wait for the ideal answer we'll never move beyond our present situation. Eventually we'll find ourselves in the dark. Kienitz observes, "Wind power will never be the whole answer to our energy problems, but it can be a part of it. We have to make choices as a society of what we want. We need to be solution oriented, and that means deciding what the compromises are that we are willing to accept - aesthetically, financially, environmentally. I have run into people who bemoan the aesthetics of wind power, the environmental impact of hydro, the pollution of thermal plants (coal, oil) and are horrified at the thought of nuclear energy. But they still want their lights to work when they flick the switch."

Keeping the lights on may mean accepting a compromise. Kienitz concludes, "When it comes right down to it, I would rather have a wind turbine in my backyard than a coal fired station in my neighborhood."