Facts about Industrial Wind Turbine Noise

- Wind farm proponents; (wind developers, participating landowners, and government officials); often rely on an industry-backed study to deny health problems. One often cited is the Massachusetts Department of Environmental Planning (DEP) "Wind Turbine Health Impact Study, which has been under a great deal of criticism, with one scientist (Raymond S. Hartman, PhD) saying it "fails to rise to the level of reliable scientific research, is incomplete, biased, distorted, without scientific merit, and not to be used as the basis for public policy." Meanwhile, there are peer-reviewed papers and studies that find links between turbine noise and ill health. Because this is currently not settled, proven science, no one, including governments can claim certainty. Because it is uncertain and involves public health and safety, government must maximize safety measures such as noise limits and setbacks to protect its citizens.

- **The FACTS are**:

    - The closer people are to wind turbines, the greater the negative impacts to them. Close proximity increases exposure to noise pollution, and other risks and annoyances.

    - Not all, but some more sensitive people suffer adverse health effects as a result of living near large wind turbines. This is a result of exposure to the audible and inaudible sound industrial wind turbines produce.

    - Scientific studies show wind turbines disturb sleep, and sleep disturbance is proven to cause impaired health.

    - Peer-reviewed scientific studies have proven the existence of infrasound (McPherson), and how it physically affects people (Salt and Kaltenbach), (Salt and Lichtenhan). "Large wind turbines generate very low frequency sounds and infrasound (below 20 Hz) when the wind driving them is turbulent. The amount of infrasound depends on many factors, including the turbine manufacturer, wind speed, power output, local topography, and the presence of nearby turbines (increasing when the wake from one turbine enters the blades of another). Infrasound cannot be heard and is unrelated to the loudness of the sound that you hear. Infrasound can only be measured with a sound level meter capable of detecting it (and not using the A-weighted scale)." - Alec N. Salt, PhD.

    - It is known that infrasound causes health problems. And it is now being established through sound studies in Brown County, Wisconsin and the Cape Bridgewater Wind Farm in Australia that large wind turbines create infrasound that can be measured in nearby homes. These are facts. The only debate is what safety measures must be taken for mitigating this. LFN and infrasound must be included in zoning regulations.

- **What a Few of the Peer Reviewed Studies are Saying**:

    - **Ambrose - Wind turbine acoustic investigation - Infrasound and low-frequency noise - A case study 2012** An acoustical study was conducted to investigate the presence of infrasonic and low-frequency noise emissions from wind turbines located in Falmouth, Massachusetts, USA. During the study, the investigating acousticians experienced adverse health effects consistent with those reported by some Falmouth residents. The authors conclude that the rapid onset of adverse health effects during the study confirms that wind turbines can harm humans if placed too close to residents.

    - **Hanning - Turbine Noise Seems to Affect Health Adversely 2012** In a survey of people residing in the vicinity of two US wind farms, those living within 375-1400 meters (1,230 – 4,593 feet) reported worse sleep and more daytime sleepiness, in addition to having lower summary scores on the mental component of a health survey than those who lived 3-6.6 km (1.9 – 4.1 miles) from a turbine, with a sharp increase in effects between 1 km and 2 km. A New Zealand

survey showed lower health related quality of life, especially sleep disturbance, in people who lived less than 2 km from turbines. A large body of evidence now exists to suggest that wind turbines disturb sleep and impair health at distances and external noise levels that are permitted in most jurisdictions.

- **Jeffery - Adverse health effects of industrial wind turbines - 2013** Industrial wind turbines can harm human health if sited too close to residents. Harm can be avoided if IWTs are situated at an appropriate distance from humans. Owing to the lack of adequately protective siting guidelines, people exposed to IWTs can be expected to present to their family physicians in increasing numbers. The documented symptoms are usually stress disorder–type diseases acting via indirect pathways and can represent serious harm to human health.

- **Nissenbaum - Effects of industrial wind turbine noise on sleep and health - 2012** We conclude that the noise emissions of IWTs disturbed the sleep and caused daytime sleepiness and impaired mental health in residents living within 1.4 km of the two IWT installations studied. Industrial wind turbine noise is a further source of environmental noise, with the potential to harm human health.

- **Phillips - Properly interpreting the epidemiologic evidence about health effects of industrial wind turbines on nearby residents 2011** There is overwhelming evidence that wind turbines cause serious health problems in nearby residents, usually stress-disorder-type diseases, It is always possible that further research will reveal that, under certain circumstances, turbines can be sited near people's homes with minimal health risk. Such is always possible for any exposure, given the nature of science (open to additional information) and changing technology. But our current knowledge indicates that there are substantial health risks from the existing exposure, and we do not know how to reduce those risks other than by keeping turbines several kilometers away from homes. Dismissal of health effects cannot be seen as honest disagreements about the weight of the evidence.

- **Salt - Infrasound from wind turbines could affect humans 2011** Based on our current knowledge of how the ear works, it is quite possible that low-frequency sounds at the levels generated by wind turbines could affect those living nearby. We can conclude that based on well-documented knowledge of the physiology of the ear and its connections to the brain, it is scientifically possible that infrasound from wind turbines could affect people living nearby.

Don't Ignore New Information

- Knowledge about this is changing fast. A groundbreaking study by sound engineer Stephen Cooper completed at the Cape Bridgewater Wind Farm in Australia proves the connection between large wind turbines and its effects on people. It found a link between an operating wind farm and the sensations of 6 residents in 3 of the nearest homes. The results of this study have prompted a senate inquiry in Australia.

- Cooper's is the first study of effects on people that included a cooperating wind farm operator, in conjunction with a researcher that does not work exclusively for wind farms. Six subjects, 3 couples from different homes, were participants in this study. They were self-selected as being particularly sensitive and susceptible to wind farm acoustic emissions, so much so that one couple has abandoned their house. Cooper found that these six subjects are able to sense attributes of the wind turbine emissions without there being an audible or visual stimulus present, and that these responses correlate with the wind turbine power being generated but not with either the sound or vibration.

- It finds that something is coming from the wind turbines to affect these people and that something increases or decreases as the power output of the turbine increases or decreases. See http://www.pacifichydro.com.au/pacific-hydro-releases-cape-bridgewater-wind-farm-acoustic-study/

- Events in Brown County, Wisconsin support the Cape Bridgewater study. A study was done at the Shirley Wind farm involving four acoustical consulting firms and included Hessler Associates, who derives significant income from wind development projects. The study found "sufficient evidence to classify LFN and infrasound emanating from the turbines as a serious issue, possibly affecting the future of the wind industry". It "showed unequivocally that low level infrasonic sound emissions from the wind turbines were detectable…" The long-term response for inhabitants at one residence studied was severe for the wife and child, causing the family to move, while the husband has experienced no ill effects. This illustrates the complexity of the issue.

- After this independent sound study was done and with careful consideration, the Brown County Board of Health declared industrial wind turbines a human health hazard. See http://bccrwe.com/index.php/8-news/16-duke-energy-s-shirley-wind-declared-human-health-hazard

These studies mean that: (1) wind farm operators cannot say there are no known effects and no known people affected. (2) Local governments charged with protecting the health and welfare of citizens cannot say any longer that they know of no adverse effects.

The Only Proven Safety Measure is a Safe Setback

- Setbacks must be measured from a non-participant's property line. A setback measured from a dwelling limits the non-participating landowner's use of their property, and greatly reduces protections for non-participants from noise pollution and its proven ill effects, shadow flicker, property devaluation, and potential property damage from blade failure or fire.

- All landowners should have the right to do with their land what they choose as long as it doesn't harm or impede a neighboring land owner. A setback for safety reasons, regardless of its distance, must be maintained. Any zoning that allows a wind turbine to be built next to a non-participant's property line eliminates that property owner from safely using that land. It creates an easement over the neighboring, non-participating property that eliminates the owner from any further developments. This amounts to an uncompensated taking of private property rights.

- Because of widespread concerns about health and safety, many jurisdictions scattered around the United States and Canada have adopted larger setbacks in recent years.

Government Entities	
Catarunk, Maine	7,920 ft.
Moscow, Maine	7,920 ft.
Haut-Saint-Laurent, Montérégie, Québéc	6,562 ft.
Fayette County, Pennsylvania	6,000 ft.
Carteret County, North Carolina	5,280 ft. from all abutting property lines
Frankfort, Maine	5,280 ft. from property line
Umatilla County, Oregon	5,280 ft. from "unincorporated community"
Mason County, Kentucky	5,280 ft. from property line
Trempealeau County, Wisconsin	5,280 ft. from inhabited structures
Hillsdale County, Michigan	5,280 ft. from residences
Sumner, Maine	5,280 ft. from property line
Newport, North Carolina	5,000 ft. from neighboring property lines
Ellis County, Kansas	4,921 ft. from rural residences
Rumford, Maine	4,000 ft. from property line
Clifton, Maine	4,000 ft. from occupied structures
San Diego, California	3,937 ft. from residences
Halifax, Nova Scotia	3,281 ft. from habitable building

Claybanks Township, Michigan	3,000 ft. from property line
Cape Vincent, New York	2,953 ft.
Potter County, Pennsylvania	2,900 ft.
Wareham, Massachusetts	2,800 ft. from residences
Goodhue County, Minnesota	2,700 ft. from non-participants
Roanoke County, Virginia	2,640 ft. from residences
Tipton County, Indiana	2,640 ft. from residences
Union Township, Wisconsin	2,640 ft. from residences
Perry, New York	2,640 ft. from residences
Rock County, Wisconsin	2,640 ft.
Buckland, Massachusetts	2,640 ft. from residences
Granville, Pennsylvania	2,500 ft. from property line
Charlton, Massachusetts	2,500 ft.
Allegany, New York	2,500 ft.
Advisory Boards	
UK Noise Association	5,280 ft.
French Academy of Medicine	4,921 ft. from residences
National Research Council	2,640 ft.
Turbine Manufacturers	
Volkswind	1,640 ft. (US) 3,280 (Germany)
Vestas Safety Manual	1,300 ft.

One Mile = 5,280 feet ½ Mile = 2,640 feet ¼ Mile = 1,320 feet
1,000 ft = 305 meters 1,000 meters = 1 km = 3,281 ft = 0.62 mi

RECOMMENDATIONS

Any zoning change that reduces the protections provided under the current Lancaster County limit of 35dBA at night significantly impacts the health of non-participating land owners.

The appropriate setback distance must be measured from the non-participant's property line, not their residence. To ensure citizen health, safety, and property rights, the setback should correspond to a distance of ten rotor heights, or not less than one mile from the non-participant's nearest property line, (unless agreed to).

LFN and infrasound must be included in zoning regulations, and the zoning specify that all post construction sound measurements can be requested by a nonparticipant, and be measured with C-weighted sound measurements to ensure that it is not excessive. The costs of all such testing should be paid by the wind developer, not the county.

The Lancaster County Health Department was provided information from Brown County, Wisconsin regarding wind turbines causing health risks. Based on responses from the Health Department, it appears this information was ignored. Ignoring this information is dangerous for our citizens.

If there is no clear scientific consensus about safety, the county must err to the side of caution and have strict sound limits and significant setbacks.