



## ALLOCATION OF WIND RIGHTS

### FORMULAS FOR COMPENSATING WIND WAKING: COMMENTS

1. A formula that considers wind wakes will be imperfect since wind wakes vary with direction and wind speed, extending in some winds only 3 rotor diameters and in other winds up to 30 rotor diameters (about 800 to 8000 feet). So determining the area and quantity of wind waking is quite variable.
2. Landowners who have turbines on their land have some acres lost to farming, access roads to farm around, maintenance access and traffic, construction disturbance, and easement encumbrances. The easement fees they are paid are just sufficient for these impacts and cannot be reduced. These farmers would not sign easement for a fraction of the revenue so that their neighbors could receive income.
3. If the developer were required to pay the landowners with turbines the current amount and pay the adjoining landowners in addition, the developer could be required to pay up to four times as much per turbine easement. That increase in cost would seriously impact the commercial viability of wind farms.
4. If adjoining landowners were paid as much as landowners with turbines, few would want turbines. Why accept the disturbance to your land when you can make significant income without any? This policy would make easement acquisition difficult for the developer.
5. The complaints in North Dakota are few. NextEra has two unresolved complaints that it is working to resolve among the 443 turbines it has constructed. Neither of these problems is about wind rights. These two and almost all other complaints come from landowners with residential "farmettes" smaller than 10 acres. A parcel this size with a home on it could not host a wind turbine and honor the 1400-foot setback required by the Public Service Commission. So there is no "taking of wind" from a farmette as there is no opportunity for a turbine on this small of a parcel.
6. Current setbacks administered by the PSC for public safety and environmental protections also protect wind rights. A setback of 1.1 times the turbine height from property lines, roads, rails, and transmission lines is administered so that a turbine structure could not topple onto a neighboring property or structure. 1.1 times turbine height is approximately 1.6 rotor diameters. If both landowners honor the 1.6 rotor diameter setback from the property line, the turbines are 3.2 rotor diameters apart which is sufficient to protect wind rights.
7. Turbine manufacturers dictate that the minimum spacing between turbines shall be approximately 3 rotor diameters to sufficiently reduce wake turbulence and thereby preserve turbine warranties. NextEra Energy often puts turbines within its own arrays at 3.2 rotor diameters. Therefore, the PSC guideline of 1.1 time turbine height from property lines guarantees the spacing between turbines on neighboring property would be no less than what is being used within a participating property and acceptable for turbine warranties.
8. A 5-10% reduction in energy due to waking is already considered acceptable within a wind turbine array. Waking impacts above that amount are rarely seen outside the array.



9. Property taxes are designed to distribute revenue from an industrial facility to provide for the general welfare. Approximately half of the property taxes go to local school districts. The large property tax bills paid by wind farms directly benefit all people in the region of the wind farm.
10. If a portion of the property taxes were reserved for distribution to the immediate neighbors of the wind farm to address the “allocation of wind rights” this would not affect wind farm economics. However, it would take money from schools and create a challenge to come up with an equitable formula for distribution of income.

#### RELATING WIND RIGHTS TO OIL RIGHTS, WATER RIGHTS, AND PROPERTY RIGHTS

11. Wind, oil, and water are significantly different. Comparing water and oil legislation to wind is inappropriate.
12. An oil field, once drained, is gone forever. Wind is constantly renewed and as abundant as the sky.
13. Water flows only one direction through a very small stream. Wind flows in all directions, re-establishes its full strength very quickly and covers the entire landscape.
14. A diversion of a stream to irrigate a field or to water livestock can deplete a major part of the flow to landowners downstream. The disturbance of the wind by a turbine has only a small fraction of impact on the strength of the wind over a small and constantly varying distance and direction.
15. Wind wakes in North Dakota are reciprocal as there are north and south winds in nearly equal amounts. So no landowner would be imposing more wake on his neighbor than the neighbor would impose upon him by erecting a turbine.
16. Practically speaking, if a landowner has a half section of land and makes his living off of it, he will not be happy if his adjoining neighbor with a 3-acre residential parcel is able to deny his right to have a wind turbine due to a wind rights formula. The residential parcel would have no room for a turbine and would deny the right of the larger farm parcel owner to earn income and provide a valuable commodity from his land. Even with compensation, the residential parcel owner may not want a turbine on his neighbors’ land due to visual impacts. This denial could be considered by the farm owner as an abrogation of his property rights.

#### CONCLUSION

The setback distance from property lines of non-participants in a wind project that is administered by the North Dakota Public Service Commission is 1.1 times turbine height that is the equivalent of 1.6 rotor diameters. With both owners honoring this setback, a minimum spacing of 3.2 rotor diameters is preserved. This along with the minimum requirement of 1400-foot setback from homes is sufficient to ensure safety and to preserve wind rights without restricting the property rights of owners wishing to have turbines on their land.

#### PUBLIC HEALTH IMPACTS



Shadow-Flicker: Shadow-flicker should be modeled and limited to 30-40 hours per year per exposed household. Shadow-flicker, if it is an annoyance, can be eliminated by placing of trees, use of curtains or window shades, or other obstructions.

Low-frequency sound: Modern upwind models of wind turbines do not produce levels of low-frequency sound or infrasound at levels of public concern. Low frequency and infrasound levels are common and found from many sources such as cars, trucks, jets, trains, industrial machinery, thunder, etc. Current models of turbines emit levels of infrasound 20-30 times lower than the level of concern set by the American National Standards Institute.

#### FOUR KEY POINTS ON WIND TURBINE SOUND AND HEALTH

- NextEra Energy Resources has never received a confirmed or documented claim of health effects from anyone, despite deploying more than 8,000 wind turbines nationwide.
- Studies from other countries or other wind farms cannot be fairly applied to our wind turbines when analyzing health concerns or establishing set backs. These studies largely focus on larger or different model types, or older designs of wind turbines, instead of the newer design type turbines, or the specific models and sizes used by Next Era. Only a fair comparison of the same turbine types and identical set backs or arrays are appropriate. The level of sound and types of sound reaching neighbors must be determined on a case by case basis, depending upon the type of turbine involved, its characteristics, and how far a turbine is separated from a neighboring residence.
- The turbines we use feature “quietness warranties”, assuring that sound levels will not exceed certain pre-determined levels, and our wind farms are designed accordingly to assure that sound levels reaching residences do not reach levels that might be cause for concern.
- In addition to concerns about sound levels reaching residences, opponents of wind farms (and the studies they cite) have voiced concerns about two specific types of sound as they may effect health: (1) Infrasound and (2) Low Frequency Sound. Independent researchers commissioned by Next Era, as well as other independent researchers have documented that the wind turbines utilized by Next Era do not generate any infrasound at all. In addition, Next Era has carefully measured low frequency sound levels emanating from its wind turbines, and have proven that the level of low frequency sound generated by the wind turbine types that Next Era uses is far lower than the levels cited by anti-wind opponents as causing concerns.



## FURTHER DETAIL ON WIND TURBINE SOUND AND HEALTH

- NextEra Energy Resources is the largest generator of wind energy in North America, yet it has never received a confirmed or documented claim of health effects from anyone, despite deploying more than 8,000 wind turbines nationwide.
- The levels of sound and types of sound reaching neighbors must be determined on a case by case basis, depending upon the type of turbine involved, its characteristics, and how far a turbine is separated from a neighboring residence.
- The turbines feature “quietness warranties”, assuring that sound levels will not exceed certain pre-determined levels.
- Independent researchers commissioned by Next Era, as well as other independent researchers have documented that the wind turbines utilized in new wind farms do not generate any infrasound at any level of concern. These studies demonstrate, without contradiction, that the turbines used in NextEra wind farms will not generate any such sound that could cause harmful health effects.
- Historically, the only turbines that have exhibited this type of sound (infrasound) at any level of concern were the older type turbines with have their blades located leeward of the nacelle. NextEra Energy does not and will not install this type of turbine in the wind farms that it constructs.
- ANSI standards and the United Kingdom’s DEFRA standards have been met.
- Studies and papers suggesting a link between sound from wind tubines and health (a) are based upon flawed reasoning and inapplicable comparisons, and (b) are not based upon any “peer reviewed literature” that are generally required prior to acceptance by the medical and scientific communities.
- Perhaps the most prominent of the anti-wind advocates is Dr. Nina Pierpont. While anti-wind advocates position her as a reliable and independant voice, she is in fact most biased and hardly independant. She first became involved in the anti-wind movement when a wind farm was planned near her home in up state New York, and she lined up to stop the development.
- Dr. Nina Pierpont, bases her conclusions (in the book she is trying to sell) upon incorrect, one-sided and misguided literature from the field of acoustic science, including one important paper written by Rick James. James’ deeply flawed paper is “The How To Guide to Criteria for Siting Wind Turbines to Prevent Health Risks from Sound”.
- The seminal premise of Mr. James’ “The How To Guide” relies upon a standard (ISO 1996-1971) that was withdrawn and superseded fully a quarter-century ago. When questioned about this under oath on May 11, 2009, Mr. James admitted this to be the case, but stated that he allowed the invalid standard to remain as the central premise of his “The How To Guide” because it was “easy to understand”. Careful examination of the use he made of this invalid standard (page 3 and 4 of “The How To Guide”) reveals this explanation to ring hollow. James merely used the (invalid) standard to castigate wind developers.

- Mr. James also completely misrepresents a very important study of wind turbines in the United Kingdom featured in “The How To Guide”. Referenced in his paper to stand for the proposition that wind farms are dangerous because of low frequency noise and must be protected against by substantial setbacks, Mr. James completely ignores the key findings of the United Kingdom study that he references (“The Hayes McKenzie study”), which are completely contrary to his conclusions.
  - The three wind farms that Hayes McKenzie studied found that the wind farms were not emitting low frequency sound;
  - That only 3 of 126 wind farms in the United Kingdom emitted low frequency sound;
  - That infrasound associated with *modern* turbines is not a source that will result sound levels that will be injurious to the health of a wind farm neighbor;
  - That low frequency sound was measurable on a few occasions, but below the level of concern.
- Implicit therefore, in the very study cited as authoritative by James, is the fact that a determination of whether a wind turbine can cause harm to health must be individually studied and determined on a case by case basis, depending upon the type of turbine involved, its characteristics, and how far it is separated from a neighboring residence.
- In addition, Dr. Pierpont’s opinions are based upon, and she cites with approval the work of James and his “The How To Guide”. Because Dr. Pierpont uses James work as the foundation for her opinions, her work is in turn deeply flawed.
- In addition, Pierpont references the study known as the “Recommendations of the French National Academy of Medicine”, and relies upon this study in making her conclusions about wind farms. However, those studies (and the more extensive set backs they recommend) are based upon a 2.5 megawatt wind turbine, rather than upon the much smaller turbines utilized by Next Era Energy in its wind farms. It only makes sense that a larger machine would be slightly louder than a smaller one, that a set back for a much larger machine would therefore be greater, and it is unfair (and unscientific) to suggest that the set back for both machines should be the same. “The French Study” is therefore completely inapplicable, and inappropriate to use in comparisons. its’ use by the objectors is unfair and misleading.
- While Dr. Pierpont has coined the phrase ‘Wind Turbine Syndrome’, it is important to note that ‘Wind Turbine Syndrome’ is not an accepted or recognized disease or malady in either general scientific or medical communities. For example, Wind Turbine Syndrome is not recognized by:
  - The American Medical Association
  - The National Institute of Health
  - The Environmental Protection Agency
  - The World Health Organization
  - The Centers for Disease Control
  - The Canadian Medical Association
  - Any Leading Medical Journals of Institutions

- It is important to point out that Pierpont’s work has not been published in peer-reviewed journals, a fact that raises additional questions as to the scientific validity of her research. In short, her views, however, are not supported by scientists who specialize in acoustics, low frequency sound and related human health impacts.
- Moreover, surveys of peer-reviewed scientific literature have consistently found no evidence linking wind turbines to human health concerns. It is important to note that all wind energy projects are required to undertake environmental assessments that determine the potential impacts of wind turbines on ecosystems and human health. The studies also ensure that the installations meet strict government regulations with respect to sound.