

# AVIATION SAFETY AND HEALTH

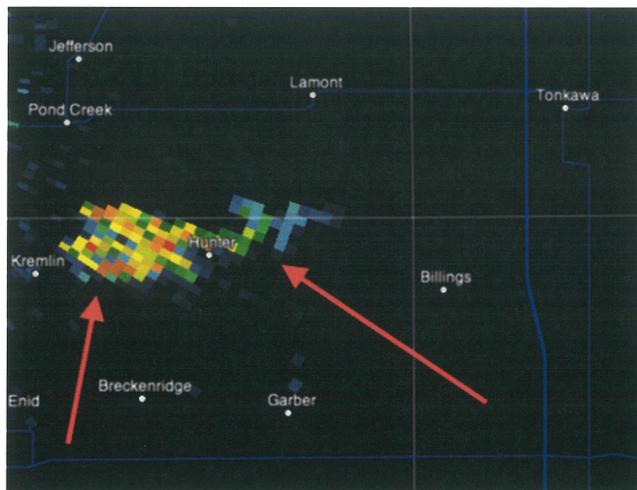
<https://wattsupwiththat.com/2013/11/07/noaa-shows-that-wind-farms-affect-weather-radar-and-that-affects-their-primary-mission-of-forecasting-and-safety/>

*“Chaotic wind velocities associated with the rotating turbine blades triggers the doppler radar mesocyclone detection algorithm”*

**Note:** this essay was written by the National Weather Service Forecast Office in Burlington, Vermont and tipped to me by a reader. Vermont’s wind farm acreage pales in comparison to places like the Texas and Oklahoma, where there are literally thousands of acres of wind farms right in the middle of tornado alley. I’ve been there and seen them firsthand.

*Certified Consulting Meteorologist Mike Smith writes:*

*While driving to Norman, OK recently I saw the newest “wind farm” to the west of Interstate 35 southwest of Tonkawa. Wind farms show up as bright ground clutter on weather radars and here it is.*



Please read Pilot Kevin Elwood’s assessment of possible harm, probable harm, with wind turbine development offshore at Cleveland and the Burke Lakefront Airstrip. It follows.

Also:

<https://www.telegraph.co.uk/travel/travelnews/5383658/Wind-farms-could-pose-danger-to-planes-without-new-air-traffic-control-radar-system.html>

## HEALTH

Please also read from the list of INTERNATIONAL Health Professionals and other experts on Health and Wind Turbines, ILFN, NOISE, VIBRATION, AND SHADOW FLICKER, and impacts on victims.

These impacts are minimalized and even discounted completely by the wind industry. It has everything to lose by listening to victims, and adjusting equipment. Indeed, it is likely that regulations everywhere are designed by the industry to protect its assets.



**Kevin Elwood**  
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RE: Case Number 16-1871 EL BGN Icebreaker

Please consider the following submission as it relates to the Icebreaker Wind Turbine project as proposed in close proximity to the Burke Lakefront Airport, Cleveland Ohio.

When traveling by air, the most dangerous portion of a flight is when the aircraft is closest to, or at, an airport. According to Transport Canada, in Canada, 87% of aircraft accidents happen at or near airports.

Needless to say, introducing 500 ft high obstacles within the airspace of any airport poses significant safety risks. Statistically, it is within 15 miles of an airport that aircraft are in the “riskiest” phases of flight and may encounter problems that jeopardize air safety.

Transport Canada data indicates that in the decade between 2002 and 2011, there were an average of 357 aircraft accidents per year in Canada and almost half of them occurred during attempted landings.

This does not take into consideration incidents that didn’t result in an accident but could have. When an aircraft gets into trouble, it needs to land as soon as possible at the nearest suitable airport. Between 2002 and 2011, according to Transport Canada, there were 5,860 incidents that required pilots to make emergency landings at a Canadian airport. Clearly, the imposition of 500 ft structures with 300 ft diameter whirling blades in the vicinity of an airport would significantly increase the risk of serious accidents.

There is growing hard evidence supporting fears that industrial scale wind turbines are a real aviation hazard, and at least some local airport authorities and local jurisdictions are taking action.

In the neighboring Province of Ontario, which shares the airspace overhead of this proposed off-shore project, a recent ruling in a 2016 ERT hearing (Wiggins vs Ontario Case No 16-036) stated that locating obstacles in the proximity of an aerodrome, or that airspace unutilized by aircraft in flight, will cause irreversible harm to human health.

The Tribunal’s ruling relied on Transport Canada directive TP1274E to understand the aviation risks associated with siting wind turbines. Its introduction, TP1274E reads:

*‘Municipal planners and developers must understand that how land is used around an aerodrome will have an impact on the aerodrome’s operations. The land use around aerodromes can have significant impacts on safety at the aerodrome and can negatively impact the operational viability of the aerodrome to the detriment of the local community that depends upon it.*

*Note: It is of the utmost importance to be aware that the proximity of obstacles, for example wind turbines, telecommunications towers, antennae, smoke stakes, etc., may potentially have an impact on the current and future usability of an aerodrome.*

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*Therefore, it is critical that planning and coordination of the siting of obstacles should be conducted in conjunction with an aerodrome operator at the earliest possible opportunity.'*

Expert witnesses provided testimony, supported by statistical studies, as to the effect of wind turbine turbulence. This is an area of expertise that is undergoing much study with the introduction of wind energy in North America. All experts agree that wind turbulence is created in the turbines' wake but the effects are unknown, however, when compared to aircraft or helicopter wake turbulence, turbine turbulence will be catastrophic if encountered by an aircraft in flight.

A study, entitled *Wind Farms Turbulence Impacts on General Aviation*, released January 18, 2014, by University of Kansas researcher, Prof. Tom Mulinazzi, finds that wind turbines could be hazardous for small aircraft. The study was done for the Kansas Department of Transportation.

According to Mulinazzi, wind turbines can set up a circular vortex that can roll a plane if it gets caught in it. A second problem, Mulinazzi says, is that wind turbines can increase crosswind speeds above what's expected, which can be a real danger to small aircraft, which don't typically take off and land with crosswinds stronger than about 20 km per hour.

The study was commissioned after the Kansas Transportation Department's aviation division started receiving a large number of reports from pilots complaining that they were experiencing unusual turbulence as they flew near wind farms. Mulinazzi and his team found that the higher the wind speed, the farther the turbulence reached – stretching almost 5 km from a single turbine – before dissipating.

Even before release of the Mulinazzi study, a coalition of pilots using the airport in Pratt, Kansas, had petitioned against plans for a wind farm to be built within 5 km of the airport runway. Part of their objection was the possibility the turbines would create winds causing dangerous turbulence.

Mulinazzi's team looked at the pilots' concerns at Pratt and another airport 8 km south of Stockton, Kansas. Researchers concluded that at both airports, pilots could potentially encounter a crosswind or "roll upset" generated from a wind turbine. Subsequently, according to Reid Bell, manager at the Pratt Airport, the Pratt wind farm project was relocated farther away from the airport. In addition, city officials approved an ordinance protecting airspace around the airport from any future wind farm hazard.

Meteorological Conditions will also elevate a flights risk assessment when in operating from an aerodrome in close proximity to obstacles. The Cleveland Burke Lakefront Airport is inherently susceptible to low visibility flight conditions due to its geographical location on the shores of Lake Erie within the chain of Great Lakes. These reduced flight visibility conditions can lead to pilots finding themselves in situations where they must decent to very low altitudes above the

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surface of the lake to maintain visual contact with the ground enabling them to safely land at Burke field. Wind turbines masked by the back drop of cloud and water will most certainly be cause for a pilot to be unable to avoid the obstacle in time once it becomes visible.

Human factors are one of the most common, leading causes in aviation accidents. Pilot Error is to be human. Humans still operate aircraft in an environment of 'see and avoid' or 'navigate and avoid'. It is proven that when a pilot operates in close proximity to obstacles the flight risk of controlled flight into terrain goes up exponentially. Burke lakefront airport is virtually free of this added obstacle flight risk. Again, I reference TP 1274E.

The land use around aerodromes can have significant impacts on safety at the aerodrome and can negatively impact the operational viability of the aerodrome to the detriment of the local community that depends upon it.

The aviation community recognizes that it is prone to deviations from published procedures on occasion. This is why the U.S.A. Department of Transport factors in deviation errors when designing flight procedures. An aircraft in flight cannot be brought to a stop or reversed so as to adjust its flight trajectory. The introduction of obstacles only goes to narrow the deviation protection of error to the point that the risk of collision is imminent, should the smallest of deviation occur due to factors beyond a flight crews' control or awareness.

Cleveland and the surrounding area depends on the Burke Lakefront Airport. Likewise, this community relies on the State of Ohio to adopt appropriate protocol in protecting public safety, and proven safe operating transportation infrastructure, when engaging in renewable energy projects. I urge you to act in the public interest in protecting your community, preserving aviation safety and preventing harm to human health by not approving wind turbines within a 15 NM radius of the Burke Lakefront Airport.

Thank you.

**Kevin Elwood**  
Southern Ontario Director - Canadian Owners and Pilots Association  
Airline Transport Pilot  
Owner Operator - Clearview Aerodrome  
Councillor Ward 2 - Clearview Township  
President - Aeroshelter

[https://yle.fi/uutiset/osasto/news/firms\\_struggle\\_to\\_cope\\_with\\_finnish\\_militarys\\_wind\\_turbine\\_ban/10374540](https://yle.fi/uutiset/osasto/news/firms_struggle_to_cope_with_finnish_militarys_wind_turbine_ban/10374540)

News 28.8.2018 16:39 | updated 29.8.2018 10:08

# Firms struggle to cope with Finnish military's wind turbine ban, excerpts

More than 200 wind energy projects have been canned in south-east Finland due to concerns that they could disrupt military radar.



Wind

turbines near the Port of Hamina. Image: Kari Kosonen / Yle

In south-east Finland, five wind turbines on the coast of the Gulf of Finland churn out electricity for regional utility Haminan Energia. Half of the electricity the firm sells is produced by wind. Demand for renewable energy is rising, but the company says it cannot build any more windmills in the south-east regions of Kymenlaakso and South Karelia.

Since late 2013, the Finnish Defence Forces (FDF) has effectively [blocked any further wind power projects](#) in south-east Finland, saying that they could interfere with radar signals. At the time, more than 200 projects were planned in the area.

Most recently, a wind park planned for the South Karelian municipality of Lemi, adjacent to the city of Lappeenranta, was rejected for that reason. An appeal of that decision is now being considered by the Supreme Administrative Court.

“We really hope that there will be a ruling this year,” says **Miika Pili**, CEO of Wind Saimaa, the company behind the project. The firm now operates a seven-turbine wind park in Lappeenranta, and is planning another near Lake Oulu further north in the Kainuu regio

<https://www.telegraph.co.uk/travel/travelnews/5383658/Wind-farms-could-pose-danger-to-planes-without-new-air-traffic-control-radar-system.html>

## HEALTH

Please also read from the list of INTERNATIONAL Health Professionals and other experts on Health and Wind Turbines, ILFN, NOISE, VIBRATION, AND SHADOW FLICKER, and impacts on victims.

These impacts are minimized and even discounted completely by the wind industry. It has everything to lose by listening to victims, and adjusting equipment. Indeed, it is likely that regulations everywhere are designed by the industry to protect its assets.



**Environmental Registry # 012-0614**  
**Ministry of the Environment Ref. # 8250-8XUKKC**

**Fairview Wind Project**

**Requesting Comments by 01 February 2014**

**Submission by Kevin & Gail Elwood**  
**8257 County Rd 91, Stayner, ON**

**Appendix 4.3**

## **THE PERILS OF WIND TURBINES**

**By COPA Director Paul Hayes**

A matter of increasing concern to our members is the almost uncontrolled spread of wind turbines across many areas of our country with, in many cases, little or no concern for the impacts on aviation.

These structures, nominally over 400 feet in height above ground, are being established either individually, in small groups or in much larger farms of over twenty or more units. In virtually every instance, there is no requirement for the proponent or authorizing authority to carry out any form of an aeronautical assessment to ascertain the potential impacts on aviation resources or local flight operations, and yet the aviation safety impacts include obstacles in the vicinity of aerodromes, wake turbulence and the lack of effective aeronautical marking and lighting in accordance with the appropriate Canadian Air Regulations and Standards.

A particularly aggressive approach to wind turbines occurred in Ontario when the government established the Green Energy Act. Prior to the passage of the legislation, COPA appeared before the committee holding hearings and petitioned to have a requirement included in the Act that wind turbine proponents or approving authorities conduct an aeronautical study to assess the aviation impacts of a proposed development and to develop appropriate setbacks and other mitigating measures. COPA's petition was not accepted and the final version of the Act also removed the ability of municipalities and other lower forms of government from controlling the development of these types of clean energy projects in their backyards.

### **Local Aircraft Flight Pattern – An International Standard:**

The typical traffic pattern (or circuit) flown by light aircraft when manoeuvring in the vicinity of aerodromes is to an international standard and pilots are expected to adhere to it when flying to and from these aerodromes. The prescribed standard pattern is normally left hand. This results in the pattern being both sides of the runways to allow for take-offs and landings in opposite directions. The normal dimensions of the pattern are 2 km off both ends of a runway and 2 km abeam the runway when in the downwind.

As a variation to the standard left hand turns in the pattern, at numerous aerodromes a right hand circuit is used under various circumstances to avoid such factors as obstacles and noise sensitive areas in the vicinity of an aerodrome. Where a circuit pattern using right hand turns is required, it must be specified in the CFS. This, of course, requires that the aerodrome is registered and therefore is listed by Transport Canada in the CFS. The appropriate provision for the use of right hand patterns or circuits is found in Canadian Air Regulation 602.96, paragraph (3) (c).

Of note is that frequently in wind turbine development proposals, proposed sites are inside the normal boundary of a traffic pattern at the aerodromes - that is, they would be between the normal downwind leg of the pattern when an aircraft would be flying abeam the runway, as well as inside the climb out and approach patterns. In this regard, the standard usually assumed is that, if possible, there should not be any tall obstacles between an aircraft flying in the circuit pattern and its access to the runway in the event of an urgent need for a landing. In the case of turbines located between the downwind, climb out and approach and the runway, this principle is violated, and it is therefore not a safe situation.

## **Transport Canada Position:**

For some certified aerodromes (airports) that have registered zoning in effect in accordance with the provisions of the federal Aeronautics Act, the airspace around them is protected from penetration by such obstacles. For many other airports and all registered and unregistered aerodromes, there is no such protection. Any obstacle erected in the approach or departure paths or in the circuit at these aerodromes may result in the raising of IFR minimum approach altitudes and overshoot or departure restrictions, modifications to circuit procedures or even prohibition of the use of one or more runways. In the worst case scenario, Transport Canada could prohibit any aviation activity at the aerodrome.

It is important to emphasize that Transport Canada's only interest in wind turbines is that these obstacles are appropriately lit and in fact they have backed away from any marking requirements, which is why you only see white turbines in Canada. Protection of our aviation infrastructure from encroachment is not of interest to Transport Canada, other than to restrict operations when a wind turbine has been assessed as a safety issue.

Wind turbines pose an additional hazard compared with other obstacles because they produce wake turbulence that can extend a considerable distance downwind. Additional precautions are necessary compared with other obstacles such as antennas in order to avoid this silent killer. Although there has been some research into wind turbine turbulence, no setbacks have been established by regulation to ensure aviation safety in the vicinity of wind turbines.

## **Determining setbacks**

The only TC guidance is contained in the certification requirements for certified aerodromes. As a suggested guideline in trying to provide an adequate level of obstruction clearance, Transport Canada refers proponents to use the obstacle limitation surfaces for a Code 1 non-instrument runway that are outlined in Transport Canada document [TP 312](#) Aerodrome Standards and Recommended Practices, Chapter 4, paragraph 4.2.2 and Table 4.1. The standard that can be most specifically applied is the take-off approach surface as the principle obstacle clearance criterion.

This surface is 2,500 meters long and diverges at 10 percent from the ends of the runway strip. At its outer limit, the surface is 560 m wide, and at the specified 1:20 slope, it would be 125 m above the elevation of the end of the runway.

In using just the 2,500 m long take-off/approach surface and the specified 1:20 slope, the height above ground at the outer limit of this surface would be 125 m or 410 feet. In addition, looking at this from the perspective of aircraft performance, and using a representative climb or descent angle of 3 degrees and a speed range of 70 to 90 miles per hour, aircraft might typically be expected to be in the order of 400 to 500 feet above ground at the 2,500 m outer end of the approach surface. When allowance is made for the effects of aerodrome altitude and air temperature during summer operations, the altitudes attained in the climb will be expected to be not as great – for example, with reference to the Koch chart in the planning section of the CFS, based on an aerodrome elevation of about 1,500 feet above sea level and a typical summer day temperature of 30 degrees C, the rate of climb for an aircraft may be reduced by in the order of 35 percent, so that the 400 to 500 feet above ground of the height of a representative turbine at

the 2,500 m point would not be reached. As the wind turbines could be in the order of at least 400 feet in height, it is concluded that the 2,500 m distance alone would not provide sufficient safety protection if a turbine were to be located in the vicinity of the end of the take-off/approach surface. As well, the effects of the wake and turbulence from a turbine if the wind is blowing toward the runway would be most pronounced on an aircraft just at this height.

For the above calculations, the Cessna 150 and 172 types, as well as the Aeronca Champ and Piper J3 Cub, have been used as representative aircraft types. However, as mentioned above, ultralight aircraft are also operated at many of the aerodromes. These aircraft, which are much lighter, typically climb after takeoff and descend for landing at a steeper angle. Because they are lighter and often climb and cruise at lower airspeeds it is understood that there may be potential for controllability issues in turbulent conditions. The matter of the wake turbulence from the wind turbines could therefore be of more concern with these aircraft.

If the TP 312 standard for the outer surface is included in the consideration, then any obstacle higher than 45 m (150 feet) above the elevation of the aerodrome within a 4 km radius of the aerodrome centre point would not be acceptable. This surface is intended to protect aircraft maneuvering in the vicinity of an aerodrome. However, to test if even the 4 km distance from the ends of a runway would provide adequate safety protection, an assessment was completed based on aircraft performance characteristics, suitable minimum obstacle clearance of at least 300 feet above the top of the turbines, and the possible wake and turbulence effects of the turbines. Using the same 70 to 90 mph light aircraft climb speed and the associated 300 to 400 feet per nautical mile (160 to 215 ft/km) climb gradient, the representative aircraft would be expected to be in the order of 700 to 850 feet above ground at the 4 km point. This should place the aircraft at least 300 feet above the top of a 400 foot high wind turbine, most likely to avoid the effects of the expected wake and turbulence. From this analysis, it might be concluded that at 4 km from the runway ends and along the extended runway centre line there would be adequate clearance.

Information on the potential effects on aircraft of wake turbulence generated by wind turbines is quite variable. Some information suggests that at three rotor diameters behind a turbine the turbulence may be largely dissipated, while other sources suggest it may still occur at a greater distance, as much as ten rotor diameters or more. Information available to us suggests that wind turbine companies may generally rely on a downwind distance of five rotor diameters in setting up the spacing between individual turbines so as to avoid the effects of wake turbulence on adjacent turbines. This standard can be applied in suggesting how far a turbine should be from a low level aircraft flight path.

For example, using a five rotor diameter downwind allowance and a nominal rotor diameter of 100 m, this would mean a separation distance of at least 500 m. This would suggest that no turbine should be located any closer than 500 m outside the 2 km outer boundary of the aerodrome air traffic or circuit pattern.

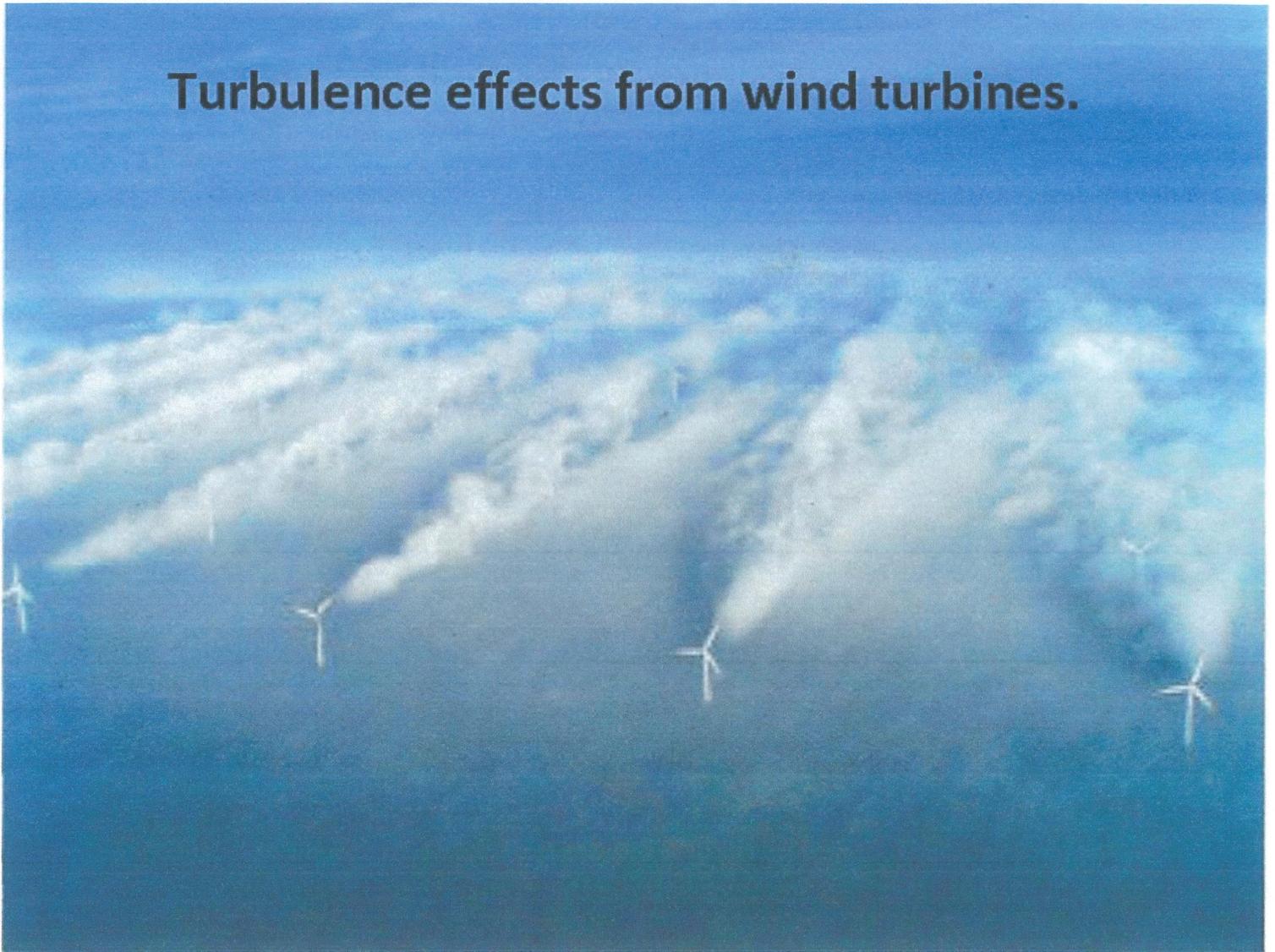
### **COPA's work in protecting aerodromes from Wind Turbine interference**

In addition to COPA's efforts to convince the Ontario government to consider the effects of wind turbines on aviation when the Green Energy Act was developed and attempts to engage Transport Canada in developing standards to minimize the safety impact on aerodromes,

COPA's Freedom to Fly Fund is being employed to investigate legal aspects to determine if there is some basis to prevent encroachment on aerodromes or provide compensation for the loss of use. Our recent win at the Supreme Court level on federal jurisdiction is being examined to see if it is applicable to wind turbine encroachment on aerodromes. The Fund is also being used to conduct a formal safety risk assessment, in which the wind generation industry, the governments and others will be invited to participate. The end point of this exercise will be to determine the safety risks associated with wind turbines and develop risk mitigation measures that can be employed, either voluntarily or by regulation, to minimize the risks and continue aerodrome operation.

Until a firm direction is established, members whose aerodromes are being impacted by wind turbine installations are advised to get involved early in the development process to make your concerns known. You can use the calculations from this article to point out the safety issues and encourage the proponents to minimize their liability by keeping the turbines a suitable distance away from the approach, departure and circuit areas.

**Turbulence effects from wind turbines.**



## **Professionals Concerned for the Health of Wind Turbine Neighbors**

**Below is a list of some of the health practitioners, researchers and acousticians who have investigated or voiced concerns for the health of wind turbine neighbors. Medical/health professionals are highlighted. Statements from some of the listed medical professionals are provided.**

*In alphabetical order:*

1. Professor Mariana Alves Pereira, Biomechanical Engineer (Portugal)
2. Dr Ian Arra, Public Health Physician (Canada)
3. Mr Stephen Ambrose, Noise Engineer (USA)
4. Associate Professor Jeffrey Aramini, Epidemiologist (Canada)
5. Dr Huub Bakker, Engineer, (New Zealand)
6. Dr Andrew Bell, Acoustician, Visiting Fellow-John Curtin School of Medical Research (Australia)
7. Dr Linda Benier, Ear Nose & Throat specialist (Canada)
8. Dr Owen Black, Ear Nose & Throat specialist (USA)
9. Dr Colette Bonner, Deputy Chief Medical Officer - Dept. of Health & Children (Ireland)
10. Mr Wade Bray, Noise Engineer (USA)
11. Professor Arline Bronzaft, Psychologist & Researcher (USA)
12. Dr Chrystella Calvert, MD, Behavioral Pediatrician (Canada)
13. Dr Nuno Castelo Branco, Pathologist (Portugal)
14. Dr Micheal Cooke, General Practitioner (Ireland)

15. Mr Steven Cooper, Acoustician (Australia)
16. Dr Herb Coussos, Medical Practitioner (USA)
17. Dr R Crunkhorne, Ear Nose & Throat specialist (UK)
18. Mrs Jane Davis, Nurse (UK)
19. Professor Phillip Dickinson, Acoustician (New Zealand)
20. Associate Professor Con Doolan, Mechanical Engineer (Australia)
21. Mr Chuck Ebbing, Noise Engineer (USA)
22. Håkan Enbom, MD, PhD, Ear Nose & Throat Specialist, Dizziness Disorders Specialist (Sweden)
23. Dr Alun Evans, Epidemiologist (Ireland)
24. Dr Amir Farboud, Ear Nose & Throat Specialist (UK)
25. Dr Robert A. Frosch, Senior Research Fellow, Harvard University; ex Administrator of NASA; member of the National Academy of Engineering, the AAES, the UK's RAE, etc.
26. Professor Jerome Haller, Neurology and Paediatrics (USA)
27. Dr William Hallstein, Psychiatrist (USA)
28. Professor Colin Hansen, Mechanical Engineer, International Expert in Low Frequency Noise & Vibration (Australia)
29. Dr Chris Hanning, Sleep Physician (UK)
30. Professor John Harrison, Physicist (Canada)
31. Dr Amanda Harry, Rural Medical Practitioner (UK)
32. Dr Gary D Hopkins, Medical Practitioner (Australia)
33. Professor Henry Horn, Ecology and Evolutionary Biology (USA)

34. Mr Richard Horonjeff, Acoustician (USA)
  35. Mr Les Huson, Acoustician (Australia)
  36. Dr Jan van Ingen Schenau, MD, Retired Physician (Netherlands)
  37. Dr David Iser, Rural Medical Practitioner (Australia)
  38. Associate Professor Rick James, Noise Engineer (USA)
  39. Dr Roy Jeffrey, Rural Medical Practitioner (Canada)
  40. Dr Mauri Johansson, Occupational Physician (Denmark)
  41. Mr George Kamperman, Noise Engineer (USA)
- 
36. Professor Ralph Katz, Epidemiologist (USA)
  37. Dr Pamela Kenny, Retired General Practitioner (UK)
  38. Dr Noel Kerin, Occupational Physician (Canada)
  39. Dr Lynne Knuth, Biologist (USA)
  40. Professor Nicholas Kouwen, PhD., P.Eng., University of Waterloo, ON (Canada)
  41. Ms Carmen Krogh, Pharmacist, Researcher (Canada)
  42. Dr Eckhard Kuck, Oral Surgeon (Germany)
  43. Dr Nicole Lachat, Biologist (Switzerland)
  44. Dr Sarah Laurie, Former Rural Medical Practitioner (Australia)
  45. Dr David Lawrence, Rural Medical Practitioner (USA)
  46. Professor Joel Lehrer, Ear Noise & Throat specialist (USA)
  47. Dr Lu Lombardi, Medical Practitioner, Ontario (Canada)

48. Dr Hazel Lynn, Medical Officer of Health, Grey/Bruce County, ON (Canada)
49. Dr. Johannes Mayer, MD (Germany)
50. Dr Robert McMurtry, CM, MD, FRCS, FACS, Former Dean of Medical & Dental School, University of Western Ontario (Canada)
51. Peter Mitchell, Engineer, Founder and Chairman of the Waubra Foundation (Australia)
52. Dr Andja Mitric Andjic, Rural Medical Practitioner (Australia)
53. Dr Sarah Myhill, Rural Medical Practitioner, Wales (UK)
54. Dr Michael Nissenbaum, Medical Practitioner (USA)
55. Mr Bill Palmer, Engineer (Canada)
56. George Papadopoulos, Pharmacist (Australia)
57. Dr Helen Parker, Psychologist (USA)
58. Dr Robyn Phipps, Researcher (New Zealand)
59. Dr Eja Pedersen, Medical Sociologist (Sweden)
60. Dr Nina Pierpont, PhD, MD, Specialist Paediatrician, Fellow American Academy of Paediatrics (USA)
61. Professor Carl Phillips, Epidemiologist (USA)
62. Mr Jerry Punch, Audiologist (USA)
63. Dr Patrick Rahilly, Pediatrician (New South Wales)
64. Mr Rob Rand, Noise Engineer (USA)
65. Mr Bruce Rapley, Scientist (New Zealand)
66. Dr Sandy Reider, Medical Practitioner (USA)

67. Linda J Rogers, Primary Health Care Nurse Practitioner (Canada)
68. Professor Alec Salt, Neurophysiologist (USA)
69. Dr Paul Schomer, Noise Engineer (USA)
70. Mrs Norma Schmidt, Retired Nurse (Canada)
71. Stanley M. Shapiro MD, F.A.C.C., Clinical Assistant Professor of Cardiology (USA)
72. Dr Daniel Shepherd, Psychologist, Psychoacoustician (New Zealand)
73. Dr Wayne Spring, Sleep Physician (Australia)
74. Mr Mike Stigwood, Acoustician (UK)
75. Dr Malcolm Swinbanks, Acoustician, (UK)
76. Dr Scott Taylor, Rural Medical Practitioner (Australia)
77. Dr Henning Theorell, Medical Practitioner (Sweden)
78. Dr Bob Thorne, Psychoacoustician (Australia, New Zealand)
79. Dr Jay Tibbetts, Medical Practitioner (USA)
80. Mr Peter Trask, Psychologist (Australia)
81. Dr A Trinidad, Ear Nose & Throat specialist (UK)
82. Dr Alan Watts, Rural Medical Practitioner (Australia)
83. Dr Colleen Watts, Scientist, former Board Member of the EPA in New South Wales (Australia)
84. Associate Professor Libby Wheatley, Medical Sociologist (USA)

**Attached are statements from the following medical/health professionals**

Dr David Lawrence, Rural Medical Practitioner (USA)

Dr William Hallstein, Psychiatrist (USA)

Håkan Enbom, MD, PhD, Ear Nose & Throat Specialist, Dizziness  
Disorders Specialist (Sweden)

Professor Carl Phillips, Epidemiologist (USA)

Dr Robert McMurtry, CM, MD, FRCS, FACS, Former Dean of Medical  
& Dental School, University of Western Ontario (Canada)

Dr Michael Nissenbaum, Medical Practitioner (USA)

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Dr Chris Hanning, Sleep Physician (UK)

Dr Alun Evans, Epidemiologist (Ireland)

Dr Mauri Johansson, Occupational Physician (Denmark)

Dr Nina Pierpont, PhD, MD, Specialist Paediatrician, Fellow American  
Academy of Paediatrics (USA)

Dr Pamela Kenny, Retired General Practitioner (UK)

Dr Sandy Reider, Medical Practitioner (USA)

Dr Owen Black, Ear Nose & Throat specialist (USA)

Dr Chrystella Calvert, MD, Behavioral Pediatrician (Canada)

Dr. Johannes Mayer, MD (Germany)

Dr Wayne Spring, Sleep Physician (Australia)

# Public Service Commission of Wisconsin (PSC)

Submitted: 4/14/2016 7:25:24 PM

## COMMENTS FILED ELECTRONICALLY IN

### 2535-CE-100

**Application of Highland Wind Farm, LLC, for a Certificate of Public Convenience and Necessity to Construct a 102.5 Megawatt Wind Electric Generation Facility and Associated Electric Facilities, to be Located in the Towns of Forest and Cylon, St. Croix County, Wisconsin**

Public Comment Open Period:  
03/16/2016 - 04/15/2016

### Commentor Information:

Name: David R. Lawrence, MD  
Address: 200 New Hartford Rd  
City: Winsted State:CT Zip:06098

**NOTE:** Public comments are currently being accepted in lieu of testimony at a public hearing pursuant to a Notice of Hearing in this docket. For written comments submitted in lieu of testifying, only one comment may be submitted per person per comment period. Only the first comment a person submits in lieu of testifying at a public hearing may be accepted as part of the official record for this docket.

### Comment:

Dear Members of the WI PSC:

I am a physician practitioner of internal medicine in my 25th year of private practice.

I have professional and personal experience with the adverse health effects of Industrial Wind Turbines (IWTs).

The Operation of IWTs is a Health Hazard to people who live within 4-6 miles of them.

My opinion is professional, credible and irrefutable.

My opinion is based on:

1-My clinical practice in Internal Medicine;

2-Scientific research of the adverse effects of IWTs that I began investigating in early 2010;

3-Personal interviews with people who are highly sensitive who are adversely affected by the operation of IWTs including residents in Colebrook, CT (BNE Wind Farm), Falmouth, MA (Falmouth Wind Farm) and Denmark, WI (Shirley Wind Farm);

4-Personal experience with my household that is within 1600 feet of the closest of 2 IWTs that began operation on October 17, 2015. 2 of 6 members are profoundly affected including my wife. We moved our bedroom to our basement on October 18.

I am a graduate of the Medical College of WI, class of 1987, a graduate of the University of CT Internal Medicine Residency Program including Chief Residency, 1991, Licensed to practice in the State of CT since 1991, Board Certified in Internal Medicine, an Assistant Clinical Professor in the Department of Medicine, University of CT, Community-Based Faculty (since 1996), a member of the CT State Medical Society, and an Executive Member of the Litchfield County Medical Association.

The adverse health effects of IWTs are well documented. McMurtry and Krogh outlined them fairly well in "Diagnostic Criteria for Adverse Health Effects in the Environs of Wind Turbines", Journal of the Royal Society of Medicine Open, 5(10)1-5. In my professional experience the most prominent symptoms are sleep disturbance, head pressure, posterior head pain, vertigo and balance disorders, cognitive clouding, the feeling of the blade sweep as a thumping pressure in the chest and intermittent heart irregularity.

My wife experiences all of these and more when she is near IWTs. Her symptoms all go away when they are not operational or she is at least a 2-3 miles or more from them.

We do not know what children and those unable to express themselves well are experiencing.

A Key Point is that symptoms are present when exposed to IWTs, and symptoms dissipate and disappear when not exposed to IWTs. There is a straight forward cause and effect connection of IWTs and adverse health effects.

Noise level is not the issue, per se. Sound frequency is. Infrasound is at least a significant part of the cause. Electromagnetic waves including "Dirty Electricity" might also be part of the cause.

I do not feel challenged by those who reject my statements. These people are not clinicians. They are self serving business men and their hired hands. (HG Leventhall should be considered amongst the most shameless of hired hands. He wrote a paper in 2004 warning the world about the health impact of low frequency sound, and now works as a speaker for the pro-wind organizations using the name Geoff

Leventhall, stating there is no problem. Robert McCunney presents nothing scientific and avoids legitimate science.) There is also an abundance of green energy idealists who do not want there to be a problem.

On a sad note, I am aware that in regions where generations of families have built communities, the imposition of IWTs by developers-with the help of governing bodies-has caused some people to abandon their homes and their towns.

IWTs are a threat to human health and should not be sited within 4-6 miles of communities.

I stand behind my testimony and can be contacted by the WI PSC if appropriate

David R. Lawrence, MD

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I affirm that these comments are true and correct to the best of my knowledge and belief.

**NOTE:** This comment is submitted in lieu of testimony pursuant to a Notice of Hearing issued by the Commission in this docket. I affirm that these comments consist of my personal knowledge or opinion only, and that I have not included information prepared by another person, and that I have not previously submitted written public comments in this docket in response to this Notice of Hearing.

*David R. Lawrence, MD*

To: Zoning Board of Appeals, Falmouth, MA  
From: William Hallstein, MD  
Subject: Wind turbine permitting

14 January 2016

Dear members of the Zoning Board of Appeals,

I am submitting this letter for your consideration as you contemplate the matter of whether or not to issue a permit for the wind turbines. In way of introduction I am a psychiatric physician and Falmouth resident since 1970. This year I will have been practicing medical psychiatry for 49(forty nine) years. Consultation/liaison psychiatry has been my focus. This means sorting out diagnostic questions about intertwined medical/psychiatric illnesses, the most difficult diagnostic questions in medicine, whether in a general hospital, locked psychiatric unit or maximum security prison. I will be brief and to the point as I explain why I urge you to deny a permit for the Falmouth wind turbines.

1. The human nervous system is the most sensitive instrument available to date for evaluating the impact of the Falmouth wind turbines on residents who live close to them. The ONLY experts in the discussion are the people who are sensing the sound, vibrations, pressure waves, etc emitted by the turbines. There is no one more "expert" than these people. No so called expert has either equipment nor information more accurate and sensitive than the affected residents' nervous systems. NO instruments more sensitive than people have been invented! Others who claim to be experts are peddling smoke and mirrors in an effort to invalidate and discredit the affected residents. Also, other turbines in other places are not the issue, since local topography must be considered. The impact of the Falmouth wind turbines on Falmouth residents who live nearby is all that is relevant. I believe they are definitely hurting people living near them and encourage you to NOT permit the turbines, now, long after they were constructed illegally.

Over the past few years I have spent significant amounts of time in the vicinity of the turbines in an effort to understand what the affected residents are describing. My findings were unanticipated and surprised me. I was not prepared for the intensity and intrusiveness of both sound and vibration felt consistently and repeatedly throughout the years of my studying the phenomena on location. I recall my introduction to the sound of "low flying jet airplanes" overhead loud enough to interrupt conversation; and, of course, the "planes" kept coming one after another in endless sequence with each rotation of a turbine blade!!! I was searching the sky looking for the aircraft when my eye caught the turbine blades, and then it all made sense, of course; no aircraft in sight, only Wind I blades. Later on, as I leaned against one of the houses in the neighborhood, I felt an unusual sensation best described as compression, coupled with a rhythmic vibration felt through my feet. Anyone who discredits, demeans and calls the affected turbine neighbors "crazy" hasn't done his or her homework, in addition to being mean spirited. The homework is not difficult: stand in the turbine neighborhood for as long as I have and feel what happens to you.

The sensations are real and disturbing. It is totally clear to me that I could not live within the radius of influence of the turbines, and I have no idea how the neighbors who are in the turbine area can sustain a healthy quality of life. Against the backdrop of what I have learned from personal experience with the effect of the turbines I see the Town of Falmouth trying to crush the residents impacted by the turbines.

2. Let's move on to sleep disturbance and sleep deprivation which is the bedrock of the area of medicine in which I have worked for 49 years! Sleep disturbance is not a trivial matter, even though it has been trivialized by the Falmouth Board of Health. Children with inadequate sleep perform poorly academically, emotionally and physically (they present a higher than normal incidence of physical illnesses). For ANYONE (athletes, truck drivers, ship operators, aircraft pilots, lawyers and physicians, et al) sleep deprived and fatigued, errors in judgement increase, accident rates increase, in addition to physical and emotional symptoms and cognitive impairment. In the world of medical observation all varieties of illnesses are destabilized secondary to inadequate sleep: diabetic blood sugars become labile and erratic, cardiac rhythms become irregular, migraines erupt and increase in intensity, tissue healing is retarded, to list a few across the entire range of physical illnesses. Psychiatric problems intensify as the sleep deprived brain decompensates; mood disorders become more extreme and psychotic signs and symptoms more severe.

People with no previously identified psychiatric illness are destabilized by sleep deprivation. Sleep deprivation experiments have repeatedly been terminated because test subjects become psychotic; they begin to hallucinate auditory and visual phenomena. They develop paranoid delusions. This all happens in the "normal" brain. Sleep deprivation has been used as an effective means of torture and a technique for extracting confessions.

I could work my way through 49 years of observing sleep disturbances and deprivation, but that is more than the scope of this letter. I am writing because I have witnessed Town of Falmouth officials and members of other boards trivialize symptom reports from people who are stalwart residents of the Town of Falmouth. I have witnessed attempts by town officials and other board members to discredit people whom I believe the wind turbines are hurting. Furthermore, all the Wind I neighbors I have examined are passionate about the need for sustainable energy in an effort to reduce fossil fuel dependence.

I see no honest way for the ZBA to issue a permit for the Falmouth wind turbines. Basically, as I see it, the town installed commercial wind generating power plants in a residential neighborhood. Inappropriately permitting the illegally sited turbines will continue to impair the development of well designed and properly sited wind turbines which are vitally needed.

Sincerely,

William Hallstein, MD  
36 South Road  
Falmouth, MA 02540

## **Infrasound from wind turbines: An overlooked health risk (Clinical report, Sweden)**

“Läkartidningen, vol. 110 (2013), pp. 1388-89.

Håkan Enbom, MD, PhD, Ear/Nose/Throat specialist, and specialist in otoneurology and dizziness disorders, and Inga Malcus Enbom MD, PhD Ear/Nose/Throat specialist and specialist in allergy and hypersensitivity reactions. Both authors are employed at the City Health ENT, Angelholm, Sweden. Contact: [inga.malcus@telia.com](mailto:inga.malcus@telia.com)

Infrasound from wind turbines affects the inner ear and is a potential health risk for people with migraine or other type of central sensitisation. Regulations for proposals of new wind turbines should be revised to take this fact into account.

### **(Infra ljud från vindkraftverk – en förbisedd hälsorisk**

Infra ljud från vindkraftverk påverkar innerörat och utgör en möjlig hälsorisk för personer med migrän eller annan typ av central sensitisering. Regelverket för nyetablering av vindkraftverk bör revideras med hänsyn tagen till denna omständighet, anser artikelförfattarna.)

Previous scientific studies on wind turbines and infrasound have been contradictory. They have therefore not been sufficiently credible when planning a framework for the establishment of wind turbines. In recent years, however, a new insight has emerged on the central sensitization, providing a better understanding of migraine, fibromyalgia and other chronic pain syndromes [1, 2] and some cases of tinnitus and dizziness. This understanding is also important for understanding how infrasound from wind turbines can affect health. Several studies have found that living near wind turbines often create severe sleep disturbance and depression. They have also found an increased incidence of dizziness, tinnitus, hyperacusis, headache, increased activation of the autonomic nervous system, etc. [3, 4].

In addition to the audible sound, which can provide noise damage and be generally disruptive, mentally, spinning wind turbines also produce a vibrant low frequency sound and infrasound that affects the inner ear and the central nervous system without damaging the hearing.

Infrasound is sound with frequencies below 20 Hz, corresponding to wavelengths of 17 meters and above, that is not perceived with normal hearing. This sound, if it is not mitigated substantially, propagates over very long distances. It arises from several sources, such as pulsating flows from chimneys, large eddies (such as wind turbines and large jet engines), traffic road and large vibrating surfaces. In scientific studies, infrasound from wind turbines has been measured at levels so low that the sound is not perceived by humans. It has also been determined that infrasound from wind turbines does not give rise to noise damage in the traditional sense [5].

In general, what has not been taken into account in these studies, is that infrasound from wind turbines has a rhythmic pulsing sound, and the pulsating sound pressure affects the inner ear, although no sound is perceived by the individual. The pressure waves propagate into the inner ear fluid-filled cavities, and this “massage effect” affects the sensory cells in the inner ear hearing and organs of balance [6]. Previous studies has not studied the effect on subjects

with migraine. Furthermore previous studies also fail to take into account the fact that some people are more sensitive than others to the sensory impact. Some people are significantly affected by the pulsating sound pressure while others are not affected by it in a significant way.

The rhythmic, pumping infrasound from wind turbines stimulates inner ear sensory functions [7, 8]. In people with migraine and sensory hypersensitivity this sensory stimulation can trigger migraine and a central sensory hypersensitivity, causing symptoms such as unsteadiness, dizziness, headache, concentration difficulties, visual disturbances, and more [9]. The problems arise even if the noise level is relatively low, since infrasound constantly affects and rhythmically changes the pressure in the inner ear via the sound paths. The pulsing sound pressure from wind turbines also indirectly activates the autonomic nervous system, causing increased secretion of adrenaline with consequent stress effects, risk of panic anxiety, high blood pressure and heart attacks for people with increased sensory sensitivity.

Migraine is caused by a genetic sensory hypersensitivity (channelopati) causing risk for central nervous sensitization [10]. Migraine prevalence is about 15 percent in the general population [11]. In addition there are other causes of central sensitization, which means that more than 20 percent of residents in the vicinity of wind turbines could be, to greater or lesser extent, affected by wind-related "annoyance." Risk groups include people with migraine disorder or a family history of migraines, people with fibromyalgia and those with a tendency to anxiety and depression [12]. Children and adults with ADHD and autism are at risk and could have their symptoms worsened.

The issue is not noise damage in the traditional sense, but the effect of a constant pulsating sound pressure that constantly changes the pressure in the inner ear and excites sensory organs there. One can liken it to pulsating or flickering lights—many people are not bothered noticeably, while people with sensory hypersensitivity may experience discomfort. Flickering light can even trigger epilepsy. Likewise, constantly pulsating, non-audible infrasound from wind turbines triggers considerable problems in people with central sensory hypersensitivity. Infrasound and low frequency sound from wind turbines is a strong trigger to elicit migraine. Thus, this sensory stimulation can, in subjects an inherited risk for migraine, elicit migraine with central sensitization and eventually become chronic, debilitating and lead to anxiety and depression and increase the risk of heart attack.

The current regulatory framework for wind turbines has not taken into account the potential risk to people with migraine and central sensory hypersensitivity. Wind turbines are being erected too close to buildings [homes]. The current regulatory framework should be revised with an increased safety distance from buildings [homes] to prevent or reduce the risk of wind-related excess morbidity.

[Läkartidningen 2013 vol. 110 no. 32–33 pp. 1388-1389](#)

[Download original document: "Infraljud från vindkraftverk – en förbisedd hälsorisk"](#)

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# Properly Interpreting the Epidemiologic Evidence About the Health Effects of Industrial Wind Turbines on Nearby Residents

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Carl V. Phillips<sup>1</sup>

## Abstract

There is overwhelming evidence that wind turbines cause serious health problems in nearby residents, usually stress-disorder-type diseases, at a nontrivial rate. The bulk of the evidence takes the form of thousands of adverse event reports. There is also a small amount of systematically gathered data. The adverse event reports provide compelling evidence of the seriousness of the problems and of causation in this case because of their volume, the ease of observing exposure and outcome incidence, and case-crossover data. Proponents of turbines have sought to deny these problems by making a collection of contradictory claims including that the evidence does not “count,” the outcomes are not “real” diseases, the outcomes are the victims’ own fault, and that acoustical models cannot explain why there are health problems so the problems must not exist. These claims appeared to have swayed many nonexpert observers, though they are easily debunked. Moreover, though the failure of models to explain the observed problems does not deny the problems, it does mean that we do not know what, other than kilometers of distance, could sufficiently mitigate the effects. There has been no policy analysis that justifies imposing these effects on local residents. The attempts to deny the evidence cannot be seen as honest scientific disagreement and represent either gross incompetence or intentional bias.

## Keywords

wind turbines, environmental health, scientific epistemology, epidemiology, case-crossover studies, adverse events

## Introduction

There is overwhelming evidence that large electricity-generating wind turbines (hereafter turbines) cause serious health problems in a nontrivial fraction of residents living near them. These turbines produce noise in the audible and nonaudible ranges, as well as optical flickering, and many people living near them have reported a collection of health effects that appear to be manifestations of a chronic stress reaction or something similar. However, many commentators (dominated by those who stand to profit from national government subsidies for building wind turbines, particularly energy companies and local governments) have repeatedly claimed that there is no evidence of risk. This appears to be widely believed by those unfamiliar with the evidence but who believe that turbines are an eco-friendly energy source (a claim that is subject to debate) and think that anything “green” must be harmless to people.

While it is typical for industries and their supporters to downplay risks and argue that the benefits make the risks worthwhile, the wholesale denial of the evidence by both business and government in this case is reminiscent of claims such as “there is no evidence that smoking causes cancer” or

“Iraq has weapons of mass destruction.” However, unlike most industry denials or *casus belli*, where critical thinkers know to exercise some skepticism before accepting the claim, the denial of the evidence of turbines seems to have produced widespread credulity among those who would be expected to know better. This may be because the epidemiologic evidence is complicated and the attempts to deny it sound like the language of science. In response to that abuse of science, the goal of this article is to empower interested observers to understand the nature and quality of the epidemiologic evidence and the weakness of the common arguments used in attempts to deny it.

It is argued here that there is ample evidence that turbines cause a constellation of health problems, and attempts to deny this involve claims that are contrary to proper methods of scientific inference. Moreover, there is no basis for claiming

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# McMurtry, Evidence of Known Adverse Health Effects, Industrial Wind Turbines

*Eminently qualified physician and surgeon, Professor Robert McMurtry, submission to the Australian Federal Senate Inquiry into The Social and Economic Impacts of Rural Wind Farms, March 2011*

"Persons living in the environs of industrial wind turbines in Ontario and in many other parts of the world are experiencing serious adverse health effects. Examples of these effects include sleep disturbance, annoyance, stress or psychological distress, inner ear symptoms, headaches, excessive tiredness and loss of quality of life. In many cases these effects are serious."

 [Read Prof McMurtry's submission →](#)

Posted on: 18 July 2013. Category: [Concerned Professionals](#), [Government Inquiries](#), [Health](#). Tags: [Adverse Health Effects](#), [Annoyance](#), [Fatigue](#), [Headaches](#), [Pressure in Ears](#), [Prof. Robert McMurtry](#), [Senate Inquiry](#), [Sleep Deprivation](#), [Stress](#).

Attachment

CANADA  
PROVINCE OF SASKATCHEWAN

Q.B. No. \_\_\_\_\_ of A.D. 2010

IN THE COURT OF QUEEN'S BENCH  
JUDICIAL CENTRE OF SASKATOON

BETWEEN:

DAVID McKINNON

PLAINTIFF

AND:

RED LILY WIND POWER LIMITED  
PARTNERSHIP,  
a limited partnership by its General Partner  
RED LILY ENERGY CORP.,  
THE RURAL MUNICIPALITY OF MARTIN NO. 122  
and  
THE RURAL MUNICIPALITY OF MOOSOMIN NO.  
121

DEFENDANTS

**AFFIDAVIT OF DR. MICHAEL M. NISSENBAUM, M.D.**

I, DR. MICHAEL M. NISSENBAUM, M.D., of the City of Fort Kent, Maine, United States of America, MAKE OATH AND SAY AS THAT:

1. I am a from the University of Toronto Medical School with post-graduate training at McGill University and the University of California.
2. I am a specialist in diagnostic imaging, whose training and work involves developing and utilizing an understanding of the effects of energy deposition, including sound on human tissues. I am a former Associate Director of MRI at a major Harvard Hospital, a former faculty member (junior) at Harvard University, and a published author.

3. I developed an interest in the health effects of wind turbine projects after becoming aware of complaints related to an industrial wind turbine installation in Mars Hill, Maine, and subsequently investigating the widespread and serious health effects suffered by most of the residents of Mars Hill, who live in proximity (within 1100 meters) to a linear arrangement of twenty-eight 1.5 MW wind turbines.

4. I have recently conducted a study of the health effects of persons living within 1100 meters of the Mars Hill Wind Turbine Project in Aroostook County, Maine, which consists of 28 wind turbines. Each turbine is 389 feet tall, from base to blade tip. This study is important because it represents the first controlled study of adverse health effects attributed to industrial wind turbines.

5. As part of the study, 22 of an estimated 30 adults living in the affected area were interviewed. Subjects interviewed included 10 females, ranging in age from 18 – 73, and 12 males, ranging in age from 43 – 79. The CONTROL group comprised of 27 individuals, 12 female and 13 male, age ranges and averages comparable to the subjects. The control group lived on average 5000 meters away from the turbine installation. A true copy of the map of the study area is attached to this, my Affidavit, and marked as Exhibit “B”.

6. Of the 22 subjects I interviewed, 18 of them (82%), reported a new onset or worsened sleep disturbance since the Mars Hill Wind Turbine Project went online in December 2006. 17 of those interviewed (77%) reported their sleep disturbance problems included waking up in the middle of the night, while 10 (45%) reported

difficulty falling asleep. There were 5 new prescription medications for chronic sleep disturbance in this group of 22 subjects. In the CONTROL group, only 1 individual (4%) reported a new or worsened sleep disturbance in the same time period since the turbines went online. There were no new prescriptions for sleep disturbance in the CONTROL group.

7. Of the 22 subjects I interviewed, 9 of them (41%) reported increased headaches since the Mars Hills Wind Turbine Project went online in December 2006, with 7 of them (32%) reporting a new onset of headaches and 2 of them (9%) reporting increased migraine frequency. There were three new prescriptions for headache medication in this group. The CONTROL group had 1 individual (4%) with a worsened headache problem in this same time period.

8. Of the 22 subjects I interviewed, 3 of them (14%) reported new or worsened problems with dizziness since the Mars Hills Wind Turbine Project went online in December 2006, 3 (14%) reported tinnitus, 3 (14%) reported a new problem with ear pulsation sensations, and 1 (5%) reported periodic ear pain. There were no auditory or vestibular complaints in the CONTROL group.

9. Of the 22 subjects I interviewed, 7 of them (32%) reported they have been troubled by shadow flicker since the Mars Hills Wind Turbine Project went online in December 2006, with 2 (9%) of those reporting nausea, and 4 (18%) reported dizziness. 1 (5%) reported triggering migraine headaches by shadow flicker, and 2 (9%) reported a

feeling of unease created by shadow flicker. There were no complaints related to shadow flicker in the CONTROL group.

10. Of the 22 subjects I interviewed, 8 of them (36%) reported they have experienced unintentional weight changes since the Mars Hills Wind Turbine Project went online in December 2006, with 6 of those reporting weight gain and 1 reporting weight loss. In the CONTROL group, there was 1 person (4%) who experienced unintentional weight change in that period.

11. Many of those affected by the Mars Hill Wind Turbine Project also reported new or worsened psychiatric symptomatology, including feelings of “stress” (13 people or 59%), “anger” (17 people or 77%), “anxiety” (7 people or 32%), “irritability” (6 people or 27%), “hopelessness” (12 people or 55%), and “depression” (10 people or 45%). Of those 8 persons who reported experiencing feelings of “depression,” all of those reported that such feelings are new since the Mars Hills Wind Turbine project went online in December 2006. There were 4 new or increased prescriptions for psychiatric medication in the subject group. The control group reported no new or increased psychiatric complaints.

12. In reporting feelings of “anger,” a 67 year old woman described it as, “Absolute rage – you feel you want to kill someone, and don’t know who to kill.” A 65 year old man described it as, “So angry I could kill.” And a 65 year old woman described it as, “Makes my blood boil.”

13. In reporting feelings of “hopelessness,” several of those affected by the Mars Hill Wind Turbine Project described those feelings, making the following comments:

- a) “Nobody will help us.”
- b) “No options – can’t leave, and can’t live here.”
- c) “This is an awful thing to have happen to you.”
- d) “People don’t believe us – (our complaints) fall on deaf ears.”
- e) “No one cares. No one listens.”
- f) “They just tread on us.”
- g) “It’s very hard watching my child suffer.”

14. Those I interviewed reported a total of 15 new and increased prescriptions for various health ailments since the Mars Hills Wind Turbine Project went online in December 2006. The CONTROL group reported 4 new or increased prescriptions in that time period.

15. 21 out of the 22 people in the subject group (95%) reported that their quality of life has been negatively affected by the Mars Hill Wind Turbine Project. Comments made by those persons when reporting that their lives have been affected include the following:

- a) “Loss of joy in living ... put a lot of life’s plans on hold.”
- b) “No desire to go outside.”
- c) “Feel trapped.”
- d) “Dreams have been dashed.”

- d) "Was our dream home ... it's all been stolen from us."
- f) "We have no peace and quiet."
- g) "My husband's (who has advanced MS) only pleasure in life was to see the wild animals. They are gone."
- h) "No sleep."
- i) "Sinking feeling every night when I (come home) and see them."
- j) "I used to be able to hear it snow, before. Now, I do not look forward to going home."

There were no perceptions of reduced quality of life in the CONTROL group.

16. One hundred percent of the persons I interviewed reported they had considered moving away. None of the CONTROL group admitted to considering moving away during that time period.

17. It is my professional opinion that there is a high probability of significant adverse health effects for those whose residence is located within 1100 meters of a 1.5 MW turbine installation based upon the experiences of the subject group of individuals living in Mars Hill, Maine. It is my professional opinion, based on the basic medical principle of having the exposure to a substance proven noxious at a given dose before risking an additional exposure, that significant risk of adverse health effects are likely to occur in a significant subset of people out to at least 2000 meters away from an industrial wind turbine installation. These health concerns include:

- a) Sleep disturbances/sleep deprivation and the multiple illnesses that cascade from chronic sleep disturbance. These include cardiovascular diseases mediated by chronically increased levels of stress hormones, weight changed, and metabolic disturbances including the continuum of impaired glucose tolerance up to diabetes.

- b) Psychological stresses which can result in additional effects including cardiovascular disease, chronic depression, anger, and other psychiatric symptomatology.
- c) Increased headaches.
- d) Unintentional adverse changes in weight.
- e) Auditory and vestibular system disturbances.
- i) Increased requirement for and use of prescription medication.

18. I have been provided with a copy of the Red Lily Wind Energy Project Environmental Assessment prepared by Tetres Consultants Inc. dated November 2008 ("Environmental Assessment"), a copy of which I believe has been filed with the Court. My review of the Environmental Assessment indicates that the proposed wind turbines to be constructed will be 1.5 to 2.5 megawatts. The wind turbines constructed in Mars Hill, Main were 1.5 megawatts.

19. In reviewing the Environmental Assessment, there is no definitive setback established with respect to the minimum distance from each resident's home a turbine could be built. The only reference I found in the Environmental Assessment, with respect to the minimum setback distance, is for the wind turbines from each resident's home is approximately "400m (varying from 300m to 600m, depending on site - specific characteristics)". This reference can be found at Page 79 of the Environmental Assessment.

20. Moreover, I have been advised by the Plaintiff and verily believe the same to be true that neither the Rural Municipality of Moosomin nor the Rural Municipality of

# Effects of industrial wind turbine noise on sleep and health

Michael A. Nissenbaum, Jeffery J. Aramini<sup>1</sup>, Christopher D. Hanning<sup>2</sup>

Northern Maine Medical Center, Fort Kent, Maine, USA, <sup>1</sup>Intelligent Health Solutions, Guelph, Ontario, Canada, <sup>2</sup>University Hospitals of Leicester NHS Trust, Leicester, UK

## Abstract

Industrial wind turbines (IWTs) are a new source of noise in previously quiet rural environments. Environmental noise is a public health concern, of which sleep disruption is a major factor. To compare sleep and general health outcomes between participants living close to IWTs and those living further away from them, participants living between 375 and 1400 m (n = 38) and 3.3 and 6.6 km (n = 41) from IWTs were enrolled in a stratified cross-sectional study involving two rural sites. Validated questionnaires were used to collect information on sleep quality (Pittsburgh Sleep Quality Index — PSQI), daytime sleepiness (Epworth Sleepiness Score — ESS), and general health (SF36v2), together with psychiatric disorders, attitude, and demographics. Descriptive and multivariate analyses were performed to investigate the effect of the main exposure variable of interest (distance to the nearest IWT) on various health outcome measures. Participants living within 1.4 km of an IWT had worse sleep, were sleepier during the day, and had worse SF36 Mental Component Scores compared to those living further than 1.4 km away. Significant dose-response relationships between PSQI, ESS, SF36 Mental Component Score, and log-distance to the nearest IWT were identified after controlling for gender, age, and household clustering. The adverse event reports of sleep disturbance and ill health by those living close to IWTs are supported.

**Keywords:** Health, industrial wind turbines, noise, sleep

## Introduction

Environmental noise is emerging as one of the major public health concerns of the twenty-first century.<sup>[1]</sup> The drive to 'renewable', low-carbon energy sources, has resulted in Industrial Wind Turbines (IWTs) being sited closer to homes in traditionally quiet rural areas to reduce transmission losses and costs. Increasing numbers of complaints about sleep disturbance and adverse health effects have been documented,<sup>[2-4]</sup> while industry and government reviews have argued that the effects are trivial and that current guidance is adequate to protect the residents.<sup>[5,6]</sup> We undertook an epidemiological study to investigate the relationship between the reported adverse health effects and IWTs among residents of two rural communities.

## Methods

### General study design

This investigation is a stratified cross-sectional study involving two sites: Mars Hill and Vinalhaven, Maine,

USA. A questionnaire was offered to all residents meeting the participant-inclusion criteria and living within 1.5 km of an industrial wind turbine (IWT) and to a random sample of residents, meeting participant inclusion criteria, living 3 to 7 km from an IWT between March and July of 2010. The protocol was reviewed and approved by Institutional Review Board Services, of Aurora, Ontario, Canada.

### Questionnaire development

Adverse event reports were reviewed, together with the results of a smaller pilot survey of Mars Hill residents. A questionnaire was developed, which comprised of validated instruments relating to mental and physical health (SF-36v2)<sup>[7]</sup> and sleep disturbance ((Pittsburgh Sleep Quality Index (PSQI)<sup>[8]</sup> and the Epworth Sleepiness Scale (ESS)<sup>[9]</sup>). In addition, participants were asked before-and-after IWT questions about sleep quality and insomnia, attitude toward IWTs, and psychiatric disorders. A PSQI score > 5 was taken to indicate poor sleep and an ESS score > 10 was taken to indicate clinically relevant daytime sleepiness.<sup>[1-4]</sup> Responses to functional and attitudinal questions were graded on a five-point Likert scale with 1 representing the least effect and 5 the greatest. The questionnaire is available on request.

### Study sites and participant selection

The Mars Hill site is a linear arrangement of 28 General Electric 1.5 megawatt turbines, sited on a ridgeline. The Vinalhaven site is a cluster of three similar turbines sited on

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## Rural GP Forced to Abandon Her Home Speaks Out

*“There is something horribly wrong with wind turbine technology,” says physician, driven out of her home.*

*The following statement was submitted (#141) on 11/1/12 to the Australian Federal Senate Committee which had requested testimony regarding the proposed Renewable Energy (Electricity) Amendment (Excessive Noise from Wind Farms) Bill 2012*

Dr Andja Mitric-Andjic  
Victoria, Australia.

I fully support the Bill because of (a) impact of noise on human well-being and (b) lack of regulations and lack of independent monitoring. I am most concerned regarding the ill effects due to wind turbines' audible and sub-audible noise.

I was living in a conservation area which is only 1.5 km away from industrial turbines. I myself, my family and most neighbours are experiencing the same cluster of symptoms from the same time since the turbines started operating ( June 2011). As a result of this our family had to move.

My [name deleted] also developed tinnitus and dizziness and I wonder how many other children are suffering around wind farms.

As a rural General Practitioner I am wondering how long will our health be compromised until somebody takes some action and recognises there is a real problem?

Infrasound is being laughed at because people do not understand the science involved. For example, UV light is invisible, but now we know it causes skin cancer. Infrasound is below our hearing range and to find out the effects it must be measured by proper, special machines. A-weighted measurements of noise tells you nothing about infrasound noise.

I tried to explain the need to measure infrasound noise around wind turbines (as I believed it is a cause of the most of the symptoms) to the authorities at my Shire, but they refused because the New Zealand Standard (NZS6808: 1998) do not require this.

I have observed in my clinic that some residents who live around wind turbines are suffering the same symptoms, which include headache, tinnitus, earache, palpitations, blurred vision, anxiety, sleep deprivation,

nausea etc.

It is obvious that there is something horribly wrong with the wind turbine technology and someone has to be accountable for all the suffering they have caused to so many people.

From my point of view, rural Australians should not be neglected. The government should use all the Health Laws to protect us and solve this serious problem urgently.

Yours sincerely,  
Dr Andja Mitric-Andjic

Posted on: 30 November 2012. Category: [Concerned Professionals](#), [Government Inquiries](#). Tags: [Anxiety](#), [blurred vision](#), [Dr Andja Mitric-Andjic](#), [earache](#), [Excessive Noise Bill](#), [Headache](#), [Hepburn Wind](#), [Home Abandonment](#), [Nausea](#), [New Zealand Standards](#), [Palpitations](#), [Sleep Deprivation](#), [Tinnitus](#).

Nov30

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## **Opening Statement of Dr Christopher Hanning MB, BS, MD**

**Proceeding Number 1955 18<sup>th</sup> November 2013**

Thank you for giving me the opportunity to testify to the adverse effects of wind turbine noise on sleep. I am sorry that I can not be with you in person.

I do not think that there is any dispute that adequate sleep is essential for human health and well being. There is a vast literature on the effects of sleep loss on brain function, the heart and circulation, metabolism to name but a few. Any thing that causes sleep loss will lead to ill health.

I do not think that there is any dispute either that wind turbine noise emissions can disturb sleep and that this is the principle reason for requiring a separation distance between turbines and homes.

The separation distance is determined either as an actual minimum distance or by reference to a calculated noise level that has been deemed to be acceptable. The acceptable noise level is derived from a variety of sources, in particular studies of the effects of traffic noise.

It must be remembered that the acceptable noise levels used in regulations and guidelines relating to wind turbines have only been derived from theoretical considerations and not from experiment at actual wind turbine sites with actual people. Until recently, there has been no experimental verification that the recommended noise levels are in fact safe and have no discernable impact on human sleep.

In my expert opinion, there is now more than sufficient evidence to conclude that wind turbine noise impairs the sleep and health of residents living at distances greater than those proposed in the project under consideration. There is a real risk to the sleep and health of any resident living within 1.5km of a turbine.

I base this opinion on three main strands of evidence. Firstly, the anecdotal evidence. Dr Phillips has dealt with this so I will not deal with further except to state that I find it convincing.

Secondly, the various general surveys taken around wind turbine installations including those of Pedersen and van den Berg in Europe and more recently by Morris and Schneider in Australia, all of which point to problems with sleep but did not use any specific test instruments for sleep quality. Again, I find the weight of evidence convincing as it all points in the same direction.

Thirdly, those studies that have used control groups and specific test instruments for sleep. Dr Shepherd's peer-reviewed study used the WHO Quality of Life test instrument which includes elements related to sleep and shows unequivocally that those living within about 1.4km of the turbines had a lower quality of life than those living several kilometres away.

Dr Nissenbaum's peer-reviewed study, to which I contributed and am an author, showed convincingly that those living within about 1.5km of wind turbines had worse sleep than those living several kilometres away. This study looked at two different wind turbine facilities.

Dr Bigelow's study, sponsored by the Ontario Government at 8 wind turbine sites, used similar sleep specific test instruments to the Nissenbaum study. The results are very similar and confirm that the closer one lives to a wind turbine installation, the more likely you are to have poor sleep. This study is complete and the results have been presented as a poster. Dr Ollson has, most unfairly, characterised this as a student study. It is not. The poster presents the results of the largest study thus far to examine the effects of wind turbine noise on sleep using test instruments specific for sleep conducted by experienced investigators who consulted widely in designing the study including with myself.

BluEarth's witnesses claim that there is insufficient evidence to prove a causal link between wind turbine noise and sleep disruption. The only study of wind turbine noise and well being which does not demonstrate harm is that of Mroczek. The study group included subjects not exposed to turbine noise and the conclusions are not justified by the data. Every other study shows harm. There is no single, well conducted, controlled and reliable piece of original research which shows that wind turbines do not cause harm at the distances proposed here., not one.

With respect to causality, affected subjects improve when exposure ceases and relapse when exposure restarts. This is prima facie evidence of causality. The studies of Pedersen as well as those of Nissenbaum and Bigelow show a clear dose-response relationship. This too is prima facie evidence of causality.

I am not a lawyer but my work with the United Kingdom General Medical Council gives me a good understanding of standards of proof. In a situation such as this where the consequence of the wrong decision is highly likely to be harm to the nearby residents, the civil standard of proof is appropriate, the balance of probabilities. In my expert opinion, the scientific evidence more than meets this evidentiary test.

Wind turbine noise from turbines of the size proposed in the project under consideration has a high risk of disturbing the sleep and impairing the health of those living within 1.5km. There are at least 25 occupied properties meeting this criterion and I advise that the proposal be refused to safeguard the occupants.



March 9, 2012

Health, Human rights, Noise, Regulations

## Wind turbine noise — BMJ editorial

Hanning, Christopher; and Evans, Alun

*Wind turbine noise seems to affect health adversely; an independent review of evidence is needed.*

The evidence for adequate sleep as a prerequisite for human health, particularly child health, is overwhelming. Governments have recently paid much attention to the effects of environmental noise on sleep duration and quality, and to how to reduce such noise.[1] However, governments have also imposed noise from industrial wind turbines on large swathes of peaceful countryside.

The impact of road, rail, and aircraft noise on sleep and daytime functioning (sleepiness and cognitive function) is well established.[1] Shortly after wind turbines began to be erected close to housing, complaints emerged of adverse effects on health. Sleep disturbance was the main complaint.[2] Such reports have been dismissed as being subjective and anecdotal, but experts contend that the quantity, consistency, and ubiquity of the complaints constitute epidemiological evidence of a strong link between wind turbine noise, ill health, and disruption of sleep.[3]

The noise emitted by a typical onshore 2.5 MW wind turbine has two main components. A dynamo mounted on an 80 m tower is driven through a gear train by blades as long as 45 m, and this generates both gear train noise and aerodynamic noise as the blades pass through the air, causing vortices to be shed from the edges. Wind constantly changes its velocity and direction, which means that the inflowing airstream is rarely stable. In addition, wind velocity increases with height (wind shear), especially at night, and there may be inflow turbulence from nearby structures—in particular, other turbines. This results in an impulsive noise, which is variously described as “swishing” and “thumping,” and which is much more annoying than other sources of environmental noise and is poorly masked by ambient noise.[4,5]

Permitted external noise levels and setback distances vary between countries. UK guidance, ETSU-R-97, published in 1997 and not reviewed since, permits a night time noise level of 42 dBA, or 5 dBA above ambient noise level, whichever is the greater. This means that turbines must be set back by a minimum distance of 350-500 m, depending on the terrain and the turbines, from human habitation.

The aerodynamic noise generated by wind turbines has a large low frequency and infrasound component that is attenuated less with distance than higher frequency noise. Current noise measurement techniques and metrics tend to obscure the contribution of impulsive low frequency noise and infrasound.[6] A laboratory study has shown that low frequency noise is considerably more annoying than higher frequency noise and is harmful to health—it can cause nausea, headaches, disturbed sleep, and cognitive and psychological impairment.[7] A cochlear mechanism has been proposed that outlines how infrasound, previously disregarded because it is below the auditory threshold, could affect humans and contribute to adverse effects.[8]

Sixteen per cent of surveyed respondents who lived where calculated outdoor turbine noise exposures exceeded 35 dB LAeq (LAeq, the constant sound level that, in a given time period, would convey the same sound energy as the actual time varying sound level, weighted to approximate the

response of the human ear) reported disturbed sleep.[4] A questionnaire survey concluded that turbine noise was more annoying at night, and that interrupted sleep and difficulty in returning to sleep increased with calculated noise level.[9] Even at the lowest noise levels, 20% of respondents reported disturbed sleep at least one night a month. In a meta-analysis of three European datasets (n = 1764),[10] sleep disturbance clearly increased with higher calculated noise levels in two of the three studies.

In a survey of people residing in the vicinity of two U.S. wind farms, those living within 375-1400 m reported worse sleep and more daytime sleepiness, in addition to having lower summary scores on the mental component of the short form 36 health survey than those who lived 3-6.6 km from a turbine. Modeled dose-response curves of both sleep and health scores against distance from nearest turbine were significantly related after controlling for sex, age, and household clustering, with a sharp increase in effects between 1 km and 2 km.[11] A New Zealand survey showed lower health-related quality of life, especially sleep disturbance, in people who lived less than 2 km from turbines.[12]

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, including the United Kingdom. Sleep disturbance may be a particular problem in children,[1] and it may have important implications for public health. When seeking to generate renewable energy through wind, governments must ensure that the public will not suffer harm from additional ambient noise. Robust independent research into the health effects of existing wind farms is long overdue, as is an independent review of existing evidence and guidance on acceptable noise levels.

[BMJ 2012;344:e1527 \(Published 8 March 2012\)](#) [1]

*Christopher D. Hanning, honorary consultant in sleep medicine*

Sleep Disorders Service, University Hospitals of Leicester, Leicester General Hospital, Leicester, U.K.

*Alun Evans, professor emeritus*

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*Provenance and peer review:* Not commissioned; externally peer reviewed.

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[1] BMJ 2012;344:e1527 (Published 8 March 2012):

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[2] [www.euro.who.int/\\_\\_data/assets/pdf\\_file/0008/136466/e94888.pdf](http://www.euro.who.int/__data/assets/pdf_file/0008/136466/e94888.pdf):

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## OPEN LETTER

### **Big Wind turbines, health and disease – a Danish perspective**

The history of wind turbines in Denmark started back in the 1970's with very small but gradually bigger wind turbines which were mostly owned by local farmers.<sup>1</sup> The big wind turbines (>1MW) came in the late 2000's but at a rather slow pace.

Documents based on the right of access in environmental and other Danish authorities have shown that already in the late 1980's there were complaints about the noise, but local as well as central authorities generally refused to investigate, and did not involve medical expertise. This happens also today.

Despite these complaints for over 20 years, unfortunately no medically based research has ever been conducted in Denmark, even not as a base for "safe" distances and noise limitations. The only research has been engineer-performed noise measurements and calculations. This ignores the human physiological impact of the wind turbine noise, previously shown in research into the impacts of other noise sources. Engineers are not physicians, and therefore cannot assess the impact on human health. Furthermore, those acoustic engineers closely connected with the wind industry have an obvious yet rarely acknowledged financial conflict of interest.

Unfortunately, the formal Danish statutory orders relating to wind turbine noise pollution have been exported internationally, together with the turbines. This is even more problematic now, because of the increasing size of the wind turbines.

With the giant wind turbines (>1MW) the relative amount of low frequency noise, which is very intrusive and easily spreads far away, is increasing. This has been shown in independent research at Aalborg University, Acoustics, Professor Henrik Moeller.<sup>2</sup> Comments recently from Australian Emeritus Professor Colin Hansen have indicated that the same intrusive health and sleep damaging wind turbine noise is occurring in Australia at Waterloo wind development (37 Danish VESTAS V90 3MW wind turbines), under certain meteorological conditions, at distances out to 10km.<sup>3</sup>

Unfortunately in Denmark there has been no systematic registration of complaints, or follow up for the people whose health and sleep have been affected by the noise. No information about risks for illness has ever been sent to GP's or the hospital system. So in fact in Denmark we have no idea of the real numbers, and most farmers are uneasy to speak up about their health/illness problems. Speaking up also risks falling house and land prices or may even totally prohibit their sale.

There is no doubt, however, that the number of complaints of sleep and health problems from Danish residents is increasing. A few residents have had relevant medical examinations and among

those who have, the causality of their symptoms from wind turbine noise has been confirmed on an individual, clinical level in a small number of cases.

Epidemiological research is totally lacking, and studies over longer time periods, too.

When the Danish statutory order for low frequency noise was renewed during 2011, after considerable pressure from the public, a senior civil servant from the Environment Authority responsible for noise pollution regulation had a meeting with wind turbine industry officials in March 2011, where it was privately mutually agreed that the new order would NOT result in greater safety distances or higher requirements for protection from the low frequency noise than the existing inadequate statutory order. This is exactly what subsequently happened, and resulted in strong protests from the Danish acousticians<sup>4</sup> and physicians<sup>5</sup> familiar with the reported health and sleep problems. The responsible authorities have continued to ignore those protests.

The CEO of Vestas, Ditlev Engel, in June 2011 sent a letter<sup>6</sup> to the then Minister of Environment to reinforce that no changes to the existing state of affairs could be acceptable, **because of the risk to Danish exports and Danish jobs**. The motivations of VESTAS and others involved in the wind industry are therefore made very clear. Their stated corporate values do not match their actions.<sup>7</sup>

The ongoing denials by VESTAS of health and sleep problems including their latest global “Act on Facts” campaign launched recently in Australia<sup>8</sup> to be rolled out globally, are further evidence of their true intentions to maximize profits and grow their company and their business, at the direct expense of the health of citizens around the world.

There are no independent epidemiological studies, which show their product (wind turbines) is safe and does not cause the sleep deprivation and adverse health effects reported by the neighbours.

On the contrary, there are a growing number of peer reviewed published studies, which show that there is considerable human distress, sleep deprivation and consequent impaired health and quality of life when wind turbines are installed as neighbours<sup>9</sup>. A number of these studies were conducted in Sweden on smaller wind turbines almost 10 years ago<sup>10</sup> confirming this problem is not new. Nor are the reported sleep and health problems caused by “scaremongering” or “the nocebo effect” in English speaking countries, as some public health advocates for the wind industry such as Professor Simon Chapman, a sociologist from Sydney University in Australia, are apparently alleging.<sup>11</sup>

So please, do not continue to misinform the public outside of Denmark about the true situation for the increasing number of Danish citizens whose health and sleep is badly affected by low frequency noise from wind turbines. The language barrier between English and Danish will not hide the truth.

These health and sleep problems are identical to those being reported around the world by wind turbine neighbours, and also by others affected by other sources of industrial low frequency noise.

The ongoing denial of FACTS about the existence of serious sleep and health problems in wind turbine neighbours is unforgiveable. So too is the refusal by authorities to properly measure the noise inside people’s homes, and the refusal to conduct the multidisciplinary medical research.

The comments made by retired Danish High Court judge Peter Roerdam in the Copenhagen Post on 16<sup>th</sup> November, 2012<sup>12</sup> that wind power is “an industry which has thoroughly corrupted the political system” is all too true, in my experience, and comes at the direct expense of the health of Danish people.

It is clear the institutional political corruption, and the lack of professional ethics on the part of wind industry acousticians and public health researchers, who ignore or deny the existence of the sleep and health problems and the consequent serious longterm damage to health, is not limited to Denmark.

Yours sincerely,

Mauri Johansson, MD, MHH  
Specialist in Community and Occupational Medicine  
Denmark, July 6<sup>th</sup>, 2013

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10. <https://www.wind-watch.org/documents/association-between-wind-turbine-noise-and-human-distress-literature-review/> page 22
11. <https://www.wind-watch.org/documents/tag/nocebo/?titles=on> for critiques of the “nocebo” research from Australia and New Zealand, which purports to provide support the scaremongering hypothesis. Notably the peer reviewed published research by Danish Acoustician Professor Moeller above (ref # 2) on the effect of the increased size of the wind turbines on increased low frequency noise is ignored by Professor Chapman.
12. <http://www.windturbinesyndrome.com/2012/wind-power-has-thoroughly-corrupted-the-political-system-says-retired-high-court-justice-denmark/>

# NINA PIERPONT M.D. PH.D.



Dear Senator Fielding,

Please accept the following letter and attachments as a formal submission to the Senate Inquiry on the social and economic impacts of rural wind farms.

The attachments consist of two chapters from my book, “Wind Turbine Syndrome: A Report on a Natural Experiment” (2009), and an updated paper I gave on the subject at an international conference held in Canada this past October (2010), “Wind Turbine Syndrome and the Brain.”

Permit me to speak plainly.

- a) The evidence for turbines producing substantial low frequency noise and, worse, infrasound, is no longer in dispute. I quote from one of numerous studies demonstrating this: “*Wind turbines and wind farms generate strong infrasonic noise which is characterized by their blade passing harmonics (monochromatic signals)*” (Ceranna et al., p. 23). In this instance, the authors are referring to a single 200 kW Vestas V47 at 200 meters—a peashooter compared to the turbines being built near people’s homes in Australia.<sup>1</sup>

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<sup>1</sup> Lars Ceranna, Gernot Hartmann, and Manfred Henger, “The Inaudible Noise of Wind Turbines,” presented at the Infrasound Workshop, November 28 – December 02, 2005, Tahiti. Federal Institute for Geosciences and Natural Resources (BGR), Section B3.11. Stilleweg 2, 30655 Hannover, Germany. Download PDF copy here: <http://www.windturbinesyndrome.com/news/2010/wind-turbines-produce-major-infrasound-period-no-question-about-it/>.

- b) Second, the clinical evidence is unambiguous that low frequency noise and infrasound profoundly disturb the body's organs of balance, motion, and position sense (called "vestibular organs").<sup>2</sup>
- c) Third, the case studies performed by me and other medical scientists have demonstrated unequivocally that many people living within 2 km of turbines are made seriously ill, often to the point of abandoning their homes.<sup>3</sup>
- d) Fourth, there is no doubt among otolaryngologists and neuro-otologists who have studied the evidence that wind turbine low frequency noise and infrasound seriously disrupt the body's vestibular organs, resulting in the constellation of illnesses I have called Wind Turbine Syndrome.<sup>4</sup>

The latest research suggests the following mechanism for Wind Turbine Syndrome: air-borne or body-borne low-frequency sound directly stimulates the inner ear, with physiologic responses of both cochlea (hearing organ) and otolith organs (sacculle and utricle—organs of balance and motion detection).<sup>5</sup>

Research has now proved conclusively that physiologic responses in the cochlea suppress the hearing response to low-frequency sound but still send signals to the brain, signals whose function is, at present, mostly unknown. The physiologic response of the cochlea to turbine noise is also a trigger for tinnitus and the brain-cell-level reorganization that tinnitus represents—reorganization that can have an impact on language processing and the profound learning processes related to language processing.<sup>6</sup>

New research also demonstrates that the "motion-detecting" otolith organs of mammals also respond to air-borne low-frequency sound. Physiologic responses and signals from the otolith organs are known to generate a wide range of brain responses,

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<sup>2</sup> For a summary, see Nina Pierpont, "Report for Clinicians," in *Wind Turbine Syndrome: A Report on a Natural Experiment* (Santa Fe, NM: K-Selected Books, 2009), pp. 26-125. Purchase a copy here: <http://www.windturbinesyndrome.com/buy.html>.

<sup>3</sup> Pierpont 2009, pp. 31-33, 127-192.

<sup>4</sup> Pierpont 2009, pp. 287-292. See also testimony by F. Owen Black, MD, FACS, found at <http://www.windturbinesyndrome.com/news/2010/owen-black/>.

<sup>5</sup> See Pierpont, "Wind Turbine Syndrome and the Brain" (2010), attached.

<sup>6</sup> Pierpont 2010, attached.

including dizziness and nausea (seasickness, even without the movement), fear and alerting (startle, wakefulness), and difficulties with visually-based problem-solving.<sup>7</sup>

Increased alerting in the presence of wind turbine noise disturbs sleep, even when people do not recall being awakened. A population-level survey in Maine now shows clear disturbances of sleep and mental well-being out to 1400 m (4600 ft) from turbines, with diminishing effects out to 5 km (3 miles).<sup>8</sup>

The *cure* for Wind Turbine Syndrome is simple: Move away from the turbines or shut them off. The *prevention* of Wind Turbine Syndrome is even simpler: Don't build these low frequency/infrasound-generating machines within 2 km of people's homes. Governments and corporations who violate this principle are guilty of gross clinical harm.

These are strong words. They are carefully chosen. They are strong because governments and the wind industry stubbornly refuse to acknowledge that they are deliberately and aggressively harming people. This must stop. The evidence is overwhelming.

Sincerely,



Nina Pierpont, MD, PhD<sup>9</sup>  
Fellow of the American Academy of Pediatrics

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<sup>7</sup> Pierpont 2010, attached.

<sup>8</sup> Pierpont 2010, attached.

<sup>9</sup> Curriculum vitae attached.

## WIND TURBINE SYNDROME – EXECUTIVE SUMMARY

*Author:* Pierpont, Nina

The core of the book [[\*Wind Turbine Syndrome: A Report on a Natural Experiment\*](#)] is a scientific report presenting original, primary research on symptomatic people living near large industrial wind turbines (1.5-3 MW) erected since 2004.

*These are the findings:*

- 1) Wind turbines cause wind turbine syndrome. We know this because people have symptoms when they are close to turbines and the symptoms go away when they are away from turbines. The study families themselves figured out that they had to move away from turbines to be rid of their symptoms, and nine out of ten have moved. Some sold and some abandoned their homes.
- 2) People do not abandon their homes out of “annoyance,” and Wind Turbine Syndrome is not a subset of annoyance.
- 3) The symptom cluster is consistent from person to person, hence the term “syndrome.”
- 4) The symptoms are sleep disturbance, headache, tinnitus (ringing in ears), ear pressure, dizziness, vertigo (spinning dizziness), nausea, visual blurring, tachycardia (fast heart rate), irritability, problems with concentration and memory, and panic episodes associated with sensations of movement or quivering inside the body that arise while awake or asleep.
- 5) Children are affected as well as adults, especially older adults.
- 6) People with pre-existing migraine disorder, motion sensitivity, or damage to inner ear structures (such as hearing loss from industrial noise exposure) are more susceptible than other people to Wind Turbine Syndrome. These results are statistically significant ( $p < 0.01$ ).
- 7) Wind Turbine Syndrome symptoms are not statistically associated with pre-existing anxiety or other mental health disorders.
- 8) The sample size of 10 families/38 people was large enough for statistical significance with regard to susceptibility or risk factors.
- 9) The susceptibility factors are clues to the pathophysiology of Wind Turbine Syndrome. The symptom complex resembles syndromes caused by vestibular (inner ear balance organ) dysfunction. The proposed mechanism is disturbance to balance and position sense by noise and/or vibration, especially low frequency components of the noise and vibration.
- 10) An extensive review of recent medical literature reveals how balance-related neural signals affect a variety of brain areas and functions, including spatial awareness, spatial memory, spatial problem-solving, fear, anxiety, autonomic functions (like digestion and

heartbeat), and aversive learning. These known neural relationships provide a robust anatomic and physiologic framework for Wind Turbine Syndrome.

11) Medical and technical literature on resonance of sound or vibration within body cavities (chest, skull, eyes, throat, ears) is reviewed, since study subjects experienced these effects.

12) Published studies of documented low frequency noise exposure (both experimental and environmental) are reviewed. These demonstrate effects on people similar or identical to Wind Turbine Syndrome. Indeed, one published study from Germany in 1996 may indeed be Wind Turbine Syndrome.

13) Recent survey studies of people who live near wind turbines in Sweden and the Netherlands are reviewed. These show that people are severely annoyed at noise from wind turbines at much lower A-weighted noise levels than for traffic, train, or aircraft noise.

14) Recommendations from the World Health Organization on environmental noise with low frequency components are reviewed.

15) Published studies of effects of environmental noise on children's learning are reviewed.

16) With regard to Wind Turbine Syndrome, further research is needed to prove its physical causes and physiologic mechanisms, determine how many people are affected, and further explore how it affects special populations, such as children.

17) This study and other studies reviewed in the report indicate that safe setbacks will be at least 2 km (1.24 miles), and longer for larger turbines and in more varied topography.

*The book further includes:*

A) Full case histories—the words and experiences of all the study subjects (including children), presented in an organized tabular format.

B) The report presented again in non-scientific, layman's language, explaining the medical, technical, and statistical aspects of the study. This section is illustrated.

C) Peer reviews and commentary by scientists and university physicians.

D) Introduction, complete list of scientific and medical references, glossary, and list of abbreviations.

## Wind Turbines Make People Ill: Fact not Fiction

Dr. Pamela Kenny

Would I say this?:

***“Hundreds of thousands of people around the world live near and work at operating wind turbines without health effects. Wind energy enjoys considerable public support, but wind energy detractors have publicized their concerns that the sounds emitted from wind turbines cause adverse health effects. These allegations of health-related impacts are not supported by science. Studies show no evidence for direct human health effects from wind turbines.”***

It is certainly not me talking.

It is the claim of The American Wind Energy Association (AWEA), the national trade association for the U.S. wind industry. Wind power developers and their lobby groups around the world are shouting the same message - that the noise and vibration (infrasound, sound pressure, and low frequency noise) produced by large-scale wind turbines produce no direct health effects.

In reality, their claim is a lie. There is an ocean of documented evidence to support the assertions of anti-wind campaigners that the noise and vibration from wind turbines causes a range of health problems in significant numbers of people. If you search for just a couple of hours online, you can find personal stories by the thousand, and also numerous highly technical research papers by eminent medics and scientists detailing, amongst others, these symptoms:

- Chronic sleep deprivation
- Sleep disturbance
- Increased blood pressure
- Increased blood sugar (dangerous for diabetics)
- Poor concentration and memory
- Depression
- Headaches and migraines
- Dizziness, unsteadiness, ear pain and vertigo
- Vibration in the body, particularly the chest
- Nausea / “seasickness”
- Tinnitus
- Sensations of pressure or fullness in the ear
- Stress
- Panic
- Annoyance, anger and aggression
- Increase in agitation by those with Autistic Spectrum Disorder, and ADD / ADHD



Some of these symptoms can be attributed to sleep deprivation. It is increasingly clear from peer-reviewed medical papers that night noise interrupting sleep has an adverse effect on both cardiovascular health and stress levels. Interrupted sleep can also have serious effects on daytime concentration leading, potentially, to increased risk of industrial accidents and road traffic collisions. As these problems are likely to occur at locations remote from the cause of the interrupted sleep they are difficult to attribute to their actual cause. Dr. Christopher Hanning, a now-retired Consultant in Sleep Disorders Medicine to the University Hospitals of Leicester NHS Trust, writes:

*In the short term... deprivation of sleep results in daytime fatigue and sleepiness, poor concentration and memory function. Accident risks increase. In the longer term, sleep deprivation is linked to depression, weight gain, diabetes, high blood pressure and heart disease.<sup>1</sup>*

I do not pretend to be an expert in the effects of noise, but I do know that in over 30 years as a GP I have seen countless patients presenting with the effects of insomnia, and shift workers in particular suffer far more than the general population with the effects of disturbed sleep. What I find astonishing is that the noise regulations for the wind industry permit MORE noise to be generated by the turbines at night than during the day. This is completely contrary to noise pollution legislation, World Health Organisation (WHO) guidelines - and common sense.

Other symptoms listed above are likely to be a response to exposure to infrasound (sound with a frequency of less than 20 Hz) and low frequency noise (sound with a frequency of less than 200 Hz) produced by the turbines. Both low frequency noise and infrasound occur naturally in the environment (for instance, from household appliances and machinery in the case of low frequency noise, and ocean waves in the case of infrasound). In periods when the wind is blustery, large wind turbines generate both very low frequency sounds and infrasound which can travel much greater distances than audible sound. These sounds are not audible to the human ear, but our brains certainly detect them and some susceptible people suffer some of the unpleasant symptoms I have listed, such as tinnitus, ear pain and vertigo. If you feel up to reading some technical, but very interesting, research on this subject, take a look at *Wind-Turbine Noise. What Audiologists Should Know* by Punch, James and Pabst, published in the American publication *Audiology Today* in 2010.<sup>2</sup>

Other reasons why people experience health impacts from wind turbines include the swishing or thumping of the blades, which is highly annoying as the frequency and loudness varies with changes in wind speed and local atmospheric conditions. This is not at all like the sound of a passing train, aeroplane or tractor which moves on rapidly to be replaced by less intrusive background sounds. The noise of wind turbines has been likened to a "passing train that never passes" which may explain why it is prone to cause sleep disruption.

Some of those with heightened sensitivity to specific repetitive stimuli, such as those with Autistic Spectrum Disorder, Attention Deficit Disorder or Attention Deficit Hyperactivity Disorder (ADD / ADHD), can be seriously affected by the noise. Consultant clinical psychologist Dr. Susan Stebbings, from the Lincolnshire Partnership NHS Trust, said more research was needed into wind turbine noise and these disorders:

*Because it is clear from our clinical knowledge of the condition of autism that the sensory difficulties individuals can have are possibly going to be impacted on by the presence of such large sensory objects in their environment.<sup>3</sup>*

Indeed, there is at least one case on record of a wind farm application being turned down because of the proven impact on children with autism.<sup>4</sup>

Then there is shadow flicker or strobing which occurs when the rotating blades periodically cast shadows through the windows of properties. This can be truly unpleasant to live with and can trigger

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<sup>1</sup> <http://www.algonquinadventures.com/waywardwind/docs/Hanning-sleep-disturbance-wind-turbine-noise.pdf>

<sup>2</sup> <http://docs.wind-watch.org/AudiologyToday-WindTurbineNoise.pdf>

<sup>3</sup> <http://www.bbc.co.uk/news/uk-england-lincolnshire-19374360>

<sup>4</sup> <http://news.bbc.co.uk/1/hi/england/humber/8646326.stm>

migraine and - much more rarely - epileptic fits in those suffering from photosensitive epilepsy.<sup>5</sup> At night, the red warning lights on the tops of some turbines can cause blade glint and strobing effects, so it is not just a daytime phenomenon.

Then there is the effect of stress. If you live in a tranquil rural area like ours, where the daytime and night time noise levels are almost always very low, you may well suffer varying levels of stress from the imposition of industrial-scale wind turbines into the landscape. The stress can occur long before the turbines are erected: during the planning process; during the noise and disruption of the construction; when you see the turbines for the first time and cannot believe the scale of them; and, then, during their operation when your sleep is disrupted and other physical and mental symptoms present themselves.

The effects of wind turbine noise have been known for several years now. In February 2007, a Plymouth GP, Dr. Amanda Harry, published a report *Wind Turbines, Noise and Health*.<sup>6</sup> The report documents her contacts with 39 people living between 300 metres and 2 kilometres from the nearest turbine of a wind farm. She discovered symptoms such as those I have outlined experienced by people living up to 1.6 kilometres from the wind farms.

The wind industry has repeatedly tried to discredit Dr. Harry's report, and another - published in 2009 - by a leading American Pediatrician Dr. Nina Pierpont, who coined the phrase "Wind Turbine Syndrome" to cover the range of health problems she investigated over five years in the US, the UK, Italy, Ireland and Canada.<sup>7</sup> The global wind industry also spends vast sums attempting to discredit scientifically sound research studies, and the papers of experts in the physiology of the ear that prove infrasound can have adverse effects despite it not being audible.

It is true that both Dr. Harry's and Dr. Pierpont's research is largely anecdotal and does not reach the high standards needed for statistical validity. However, that also applied to reports on the association between lung cancer and smoking, and asbestos and asbestosis, in the early days.

We have now reached the stage in the debate when there can be no reasonable doubt that industrial wind turbines - whether singly or in wind farms - generate sufficient noise to disturb the sleep and impair the health of those living nearby.<sup>8</sup> In fact, our own Government has long been fully aware of the problems, as demonstrated in a 2008 Economic Affairs Committee Memorandum by Mr Peter Hadden, which concludes:<sup>9</sup>

*...onshore wind turbines built within 2km of homes offer no benefits and should not be part of a plan to provide the UK with a viable, secure, predictable supply of electricity. Indeed, onshore wind turbines ensure an unpredictable energy supply, by the very nature of the wind, with a long list of adverse impacts that diminish their supposed usefulness. Other renewables, such as solar and hydropower, offer more options and more predictability, especially combined with the still necessary (and technologically advancing) conventional sources of energy.*

I find it unbelievable that the wind industry is permitted to inflict health nuisance such as sleep disturbance, stress, and headaches on our communities - let alone more serious health issues such

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<sup>5</sup> <http://www.ncbi.nlm.nih.gov/pubmed/18397297>

<sup>6</sup> [www.savewesternny.org/pdf/wtnoise\\_health\\_2007\\_a\\_barry.pdf](http://www.savewesternny.org/pdf/wtnoise_health_2007_a_barry.pdf)

<sup>7</sup> <http://www.windturbinesyndrome.com/wind-turbine-syndrome/>

<sup>8</sup> <http://www.noiseandhealth.org/article.asp?issn=1463-1741;year=2012;volume=14;issue=60;spage=237;epage=243;aulast=Nissenbaum>

<sup>9</sup> <http://www.publications.parliament.uk/pa/ld200708/ldselect/ldeconaf/195/195we34.htm>

as depression, and heart and diabetes problems. To suggest, as the wind industry does, that there is “no problem” when faced with the huge body of evidence from around the world is perverse.

What sums up this entire problem for me is the quote below. It is by Dr. Noel Kerin of the Occupational and Environmental Medical Association of Canada. He was attending the First International Symposium on Adverse Health Effects and Industrial Wind Turbines, held in Canada in October 2010. He was shocked by the overwhelming evidence on the harmful effects of wind turbines:

*First we had tobacco, then asbestos, and urea formaldehyde, and now wind turbines. Don't we ever learn? Our public health system should be screaming the precautionary principle. The very people who are sworn to protect us have abandoned the public.*<sup>10</sup>

My extensive reading into the harmful effects of wind turbines leaves me in no doubt that, to protect our community, we need to oppose the erection of three 125 metre turbines on Berry Fen. Quite aside from the damage to our beautiful landscape, our tranquillity, our tourism industry, and wildlife, this wind farm would have serious implications for the health of many who live and work here for the entire 25-year life of the wind farm, and well beyond.

There is still time to object to the planning application. You do not have to write a long letter - just a couple of points outlining why you object will be perfect, and every single person in your household should write individually as the number of objections will make a difference. Whichever method you choose, please include your name and full postal address, and the Planning Application Number 14/00728/ESF:

- Send your objection by email to [plservices@eastcambs.gov.uk](mailto:plservices@eastcambs.gov.uk)
- Or write to: Mrs Penny Mills, Planning Officer, East Cambs District Council, The Grange, Nutholt Lane, Ely, CB7 4EE
- Or drop off to the following addresses: Simon Monk, Dunelm House, 4d The Borough, Aldreth and Ian Munford, 4 Orchard Way, Haddenham.

#### **About Dr. Pamela Kenny MB.BS.,MRCS.LRCP.,FIMC RCSEd.**

Dr. Pamela Kenny was a founder of the current Haddenham and Stretham GP surgeries in 1986. She retired from practice there in 2006, but continued to work in Cottenham and St Ives and is a Trustee of the emergency medical service MAGPAS.

Dr. Kenny has always had an interest in how lifestyle factors affect patient's health, and continues to do so in the interests of the community. She has immense sympathy with anyone who might be affected by any form of flicker as she has always suffered from flicker-induced migraine. She also has the kind of hearing that is super-sensitive to both high and very low sound.

Photo credit: <http://www.publicdomainpictures.net/view-image.php?image=82819&picture=woman>

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<sup>10</sup> <http://www.windvigilance.com/international-symposium/wind-turbines-linked-to-sick-building-syndrome>

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**TESTIMONY SENATE ENERGY AND NATURAL RESOURCES COMMITTEE 1/31/13**

Good morning, thanks very much for the opportunity to speak about some clinical observations regarding the health impacts of living in close proximity to large wind turbines.

My name is Sandy Reider ..... since graduation from Harvard Medical School in 1971 I have practiced more or less continuously in VT in various capacities, most recently for the past 17 years in a primary care setting in Lyndonville.

In the brief time I have, I'd simply like to share some of my clinical observations and impressions regarding the health impacts related to living near these turbines and leave a review of the available science to others (parenthetically, I am delighted you will be hearing from Stephen Ambrose because it was his on site Falmouth, MA study that I selected to pass on to Commissioner Chen when he came to speak in Newark this past summer).

At this point I have seen 6 persons in my office with symptoms that seem to stem from these turbines, but for the sake of clarity and brevity, I will describe just one case in detail ... keeping in mind that the symptoms described by all those I have seen are quite similar and characteristic of what has become known, somewhat euphemistically, as Wind Turbine Syndrome.

This was my first patient who turned out to suffer from this syndrome, and I must say that it took a few months for us to connect the dots. He was a healthy 33 yo man who I had treated for several years and knew quite well. He had no preexisting medical problems, took no prescription meds, was happily married (no children), and had lived in his home for several years before a single NPS 162 foot wind turbine was installed in the late autumn of 2011, approximately 1800 feet from his residence. At the time of installation he paid no attention at all to the turbine and had no particular feelings about it one way or the other, aesthetic or otherwise.

About 3 weeks after the installation he began to experience quite severe insomnia, something he had never dealt with before, and he had no clue why. He worked at home and spent most of his days as well as all nights there, unlike his wife who worked in Newport and was gone most days. He complained of abrupt waking 30-40 times a night, like a startle reflex, associated with some anxiety. As a result he was almost never able to fall into a deep restful sleep, very distressing for someone used to sleeping soundly for 10-11 hours every night.

Additionally he developed a kind of pressure headache, ringing in his ears, and slight dizziness. These symptoms weren't constant but varied from day to day (eventually discovered to be related to wind speed and direction). His ability to concentrate diminished and it became difficult to get his work as a financial advisor done, as well as feeling irritable and somewhat depressed.

On his 3<sup>rd</sup> visit over 6-8 weeks during the spring of 2012, he quite emphatically declared that he was experiencing something called WTS. At the time I inwardly rolled my eyes, but after conducting some research, I decided it might just be possible. To test this hypothesis, he and his wife went on a 3 week vacation, and within 1-2 days of being away from home, ALL his symptoms resolved. On return, the same distressing sensations gradually returned. This amelioration when away was confirmed dozens of times ... he became aware that when the wind was coming out of the north or northwest he was particularly affected, and so arranged to sleep at a friend's house on those nights .... Generally he spent 3-4 nights away from home throughout the spring and summer of 2012, and on those nights felt and slept well.

Interestingly, at no time at home did he actually hear any noise ... his distress was likely the reflection of very low frequency sound/vibration, sound below the audible range. In trying to compare this to something in my own experience, the closest image that comes to mind is that of a teenager driving around in the spring with those big bass speakers in the trunk of his car .... a rhythmic thumping that can be sensed, and felt, from over a block away, while the rest of the higher frequency musical tones cannot be heard at all.

Most patients have complained about audible noise as well as a rhythmic flickering shadow as the turbine blade crosses the sun, also the rhythmic flashing glare from the reflection of the sun on the blades (such flickering lights are known in the medical literature to precipitate seizures in susceptible individuals ), and these are of course significant, but I have chosen to describe this case because so little attention has been given to inaudible low frequency vibration. My patient was fortunate, he and his wife were able to afford to abandon their home, and they are now living happily far from any wind turbine and feeling quite well.

As I said, I have seen 5 other individuals with similar syndromes, and it easy to imagine how this state could easily presage more chronic illness .... depression, anxiety, high blood pressure, chronic headaches, the list goes on ... and all the pharmaceutical drugs that these maladies might eventually necessitate. I would be concerned for those whose nervous systems are sensitive and vulnerable .... infants and small children, children with ADHD or autism spectrum syndromes, and constitutionally nervous adults. I know you will hear stories this morning from Vermonters who have already been directly impacted.

The old saw that a doctor's best teacher is his patient is true and obviously applicable here. From a purely clinical perspective I believe the acoustic trauma produced by large wind turbines is real and significant, and that this makes the siting of these turbines especially critical.

Keep in mind that the turbine affecting the person I described previously is only 160 feet high, whereas the turbines already spinning in Lowell and Sheffield are about 450 feet high, and those proposed for the Newark/Brighton/Ferdinand project are close to 500 feet. I note that a minimal setback of 1 mile from the nearest residence is specified in S.30 , but due to the great variety of atmospheric conditions and geography in VT, who knows if even this is adequate?

Also, I was surprised that in the bill there is no specific mention of effects on health, though "quality of life" comes close. These health effects are more than nuisances, a term used in much of the literature to characterize the symptoms. A nuisance might be something like black flies buzzing around your head, whereas these vibratory and acoustic effects are something else altogether, and describing them a nuisances seems a disservice and demeaning to those who experience them. What about "chronic vestibulo-acoustic trauma syndrome" ... we certainly need better science, and more study is needed.

I believe these health impacts should be specifically cited in the bill, with a recommendation directing the VT Department of Health to adopt a more direct, proactive role in the public health issues raised by these huge turbines.

I fully support the three year moratorium on all industrial wind development as outlined in the current bill, in order to try to understand more clearly the sacrifices we are asking of our citizens and of the complex ecology of our sensitive and beautiful ridgelines.

Thank you.

Sandy Reider MD

# Ignoring harm of noise

*Credit:* By Dr. Sandy Reider | Rutland Herald | January 24, 2016 | [www.rutlandherald.com](http://www.rutlandherald.com)

The Vermont Health Department and the Vermont Department of Public Service persist in reassuring us that there are no significant health effects related to industrial wind turbines under Vermont's current noise standards.

Such a blanket statement is not only incorrect, it is a disservice to the Vermonters who are already experiencing adverse health effects, such as headaches, vertigo, nausea, anxiety, ringing in the ears and, most importantly, chronic repetitive sleep disruption. There is an ongoing academic debate about the mechanisms behind these effects (direct vs. indirect, the nocebo "its all in your head" effect, audible vs. inaudible infrasound), but little disagreement that some persons living too close to these large wind turbines are suffering, whatever the mechanism.

Critical methodological shortcomings plague many of the large-scale industry or government-sponsored studies that state agencies rely upon to establish protective sound levels:

- Failure to measure the full sound spectrum, in particular ignoring the very low frequencies that are likely responsible for many of the reported adverse health effects.
- They assume a constant sound pressure and tone, not at all like the impulsive sound produced by large turbines, which has its own distinct signature that differs from other environmental sources (planes, trains, automobiles, wind, leaves rustling).
- Sound levels are often averaged over an hour, or longer, making it possible for periods of very loud intrusive sound to fall within an "acceptable" calculated level.
- Measurements are usually not taken indoors, where the sound may be more intrusive due to the well-established resonance effects of low frequency sound.
- Most importantly, the large studies fail to focus their investigations on those households that are most severely affected.

In spite of these research design limitations, a recently released large Health Canada study found that at wind turbine sound pressure levels greater than 35 dB(A), health-related complaints will increase, and at levels greater than 40 dB(A) a significant number of persons will be "highly annoyed" (meaning adverse health effects, especially sleep disturbance).

The current Public Service Board threshold of 45 dB(A) of audible sound through an open window, averaged over an hour, has actually never been proven safe or protective. Some studies recommend that audible sound should not exceed 35 dB(A), or 5 dB(A) above normal background sound levels. (This is crucial in rural areas where background noise is minimal, particularly at night). The level should be a maximum, not an hourly average. Above 35 dB(A) there are likely to be significantly more complaints, particularly difficulty sleeping.

Several recent small, well-designed, independent clinical studies (Ambrose & Rand, Nissenbaum, Pierpont, Shomer, Cooper, Thorne) that do take the aforementioned factors into consideration, all conclude that lower, more protective noise limits for these huge industrial wind installations are needed (for more details: [docs.wind-watch.org/DRSANDYREIDER\\_042413.pdf](http://docs.wind-watch.org/DRSANDYREIDER_042413.pdf)).

To the benefit of the wind industry, and apparently to those agencies promoting large wind installations on our ridgelines here in Vermont, the issue of infrasound has thus far been successfully suppressed and ignored. Space does not permit a detailed discussion, but consider the following:

— The World Health Organization has definitively established (2009) that inaudible very-low-frequency infrasound is a human health hazard, that it can disturb sleep, and increase heart rate and blood pressure, leading in susceptible individuals, to permanent effects such as hypertension and cardiovascular disease, even at sound levels below 30 dB(A).

— In the mid 1980s, Neil Kelley and his team thoroughly documented significant adverse health effects resulting from inaudible, very-low-frequency sound produced by a large wind turbine in Boone, N.C. This scientifically rigorous NASA and Department of Energy-sponsored study, in cooperation with MIT and four other prestigious universities, as well as the wind industry, has been conveniently dismissed as irrelevant by current wind developers, even though the study's conclusions have never been disputed, and even though we now know that the large turbines being installed today do indeed generate clinically significant amounts of infrasound.

— Three more recent preliminary studies (Ambrose & Rand's Falmouth, Mass., 2011; Shomer, Rand, et. al., Shirley project, Brown County, Wisconsin, 2012; Cooper, Bridgewater, Australia, 2014 ) of projects with large modern upwind turbines have replicated and confirmed Kelley's findings; i.e., infrasound, not audible sound, is a major contributor to the health fallout from today's industrial wind projects.

Taken together with the thousands of case reports from around the world (I personally have seen three families here in the Northeast Kingdom that have been forced to abandon their homes due to adverse health effects from nearby wind turbines), stricter full-spectrum noise standards for these large wind projects are urgently needed. However, Vermonters should not expect meaningful change until the governor, as well as his appointees in the Health and Public Service departments, recognize the importance of being more inclusive in their selection of scientific data, and until they demonstrate a genuine willingness to take the health complaints of the neighbors of these turbines seriously.

*Dr. Sandy Reider is a physician who lives in Lyndonville.*

Read the original letter in the Rutland Herald here:  
<http://www.rutlandherald.com/article/20160124/OPINION06/160129797>

With thanks to National Wind Watch: <https://www.wind-watch.org/news/2016/01/24/ignoring-harm-of-noise/>

BEFORE THE  
COUNTY OF DEKALB  
PLANNING AND ZONING COMMITTEE

In the Matter of:

FPL Energy Illinois Wind, LLC, applicant.

)  
)  
)  
)

No. MI-09-01

AFFIDAVIT OF DR. F. OWEN BLACK, M.D.

I, DR. F. OWEN BLACK, M.D., being duly sworn on oath, do depose and state as follows:

1. I am a medical doctor specializing in neuro-otology, focusing on balance and vestibular (inner ear) disorder research. I am an internationally known neurotologist and human vestibular physiologist. I am an expert in disorders of the inner ear. Attached hereto as Exhibit A is a true and accurate copy of my curriculum vitae.

2. I graduated from the University of Missouri Medical School in 1963. After completing a residency in otolaryngology at the University of Colorado and a National Institutes of Health-sponsored fellowship in otology, I served as a combat surgeon in Vietnam with the United States Navy. I have been practicing medicine for 46 years.

3. I am a Fellow of the American College of Surgeons and Senior Scientist and Director of Neuro-Otology Research at Legacy Health System in Portland Oregon. I have received funding from the National Institutes of Health and NASA in connection with my research pursuits related to disorders of the inner ear.

4. I have recently reviewed Dr. Nina Pierpont's study entitled "Wind Turbine Syndrome", which I understand will be published shortly.

5. Based upon my review of Dr. Pierpont's report, I believe this study is an important initial contribution to understanding the effects of low frequency pressures on the inner ear and other organs.

6. As an expert in vestibular disorder research, it is my opinion that the symptoms reported and described by Dr. Pierpont in her Wind Turbine Syndrome study are consistent with symptoms I see as part of my work with disorders of the inner ear, including sleep disturbance, headache, tinnitus, ear pressure, dizziness, vertigo, nausea, visual blurring, tachycardia, irritability, problems with concentration and memory, and panic episodes associated with exposure to low frequency, high amplitude, ambient pressure fluctuations.

7. I am familiar with studies conducted by the United States Navy relating to low frequency sound pressure patterns, which report symptoms similar to those reported by Dr. Nina Pierpont in her Wind Turbine Syndrome study.

8. In my opinion, based upon the similarity between Dr. Nina Pierpont's study, the Naval studies, and patients with otic capsule defects that produce similar symptoms, the hypothesis that low frequency sound pressure patterns emitted by commercial wind turbines cause the symptoms outlined above needs to be investigated further.

9. I have recently agreed to assist with a study in the planning stage that will attempt to determine whether low frequency sound pressure patterns emitted by commercial wind turbines cause the symptoms outlined above.

Further the Affiant sayeth not.

Dated: 8 May 2009

F. Owen Black  
Dr. F. Owen Black, M.D.

SUBSCRIBED and SWORN to  
before me this 8 day of May 2009.

Karen L. Sheets  
Notary Public Volusia County



Dr. Chrystella Calvert  
109 King Street West  
Dundas, ON L9H 1V1  
905-628-9200

October 5, 2012

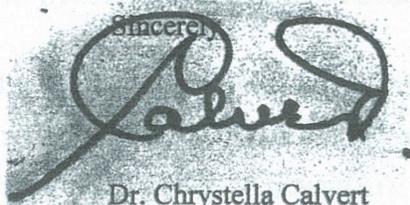
To Whom It May Concern:

I am a behavioural Pediatrician and I specialize in assessment and care of children with developmental and mental health problems. My patient, Joey Correia, has been under my care since May, 2007. He has complex developmental issues including significant Sensory Processing Disorder.

He has always been sensitive to sensory environmental stimuli, which is quite noxious and problematic. Through sensitive and thoughtful interventions, by school and family, Joey has been able to cope much better. Much focus has been placed on reducing strong or noxious stimuli in the immediate environment.

Every human attempt to understand their world via input through the sensory organs which detect changes or threats in the environment. Noxious stimuli (or unexpected, or unnatural stimuli) are a source of environmental stress that affect the human brain and mounts a physiologic response to restabilize. For "typical" brains, known sources of environmental stress include airports, highways and industry. Wind turbines concern me, given my strong knowledge of neurobiology. Due to well-documented disruption to the "normal" environment (vibration, noxious repetitive sound) this is potentially a danger to health. There is also a rational fear that families living near these structures are being exposed, and have no reassurance of the long-term effects on health, particularly brain biology. In children, the developing brain is exquisitely sensitive and plastic – it relies on clean inputs to develop normally. Science has no evidence that this abnormal, incessant stimulus does not have long lasting effects on the developing fetal child and adolescent brain. Applying basic principles in fact suggest great danger of disrupting normal human neural networks. Certainly Joey is exceptionally more vulnerable. I have seen him become destabilized and quite impaired due to sensory overload. It results in agitation, insomnia, and mood changes. He is currently functioning very well and has a very good quality of life. His mother purposely moved to a quiet, rural home as an accommodation for Joey.

I, as a "normal brain" (or typical brain) individual would *not* want this risk to my mental health (or my children's) in my neighbourhood. The placement of these devices must be thoughtful and, of course, "first, do no harm." In a developed society like Canada, we must advocate and protect the most vulnerable members. Joey, and all our children deserve our thoughtful and ethical best.

Sincerely,  
  
Dr. Chrystella Calvert

with the brain, and the serious effects it can have on the human organs, citing a study from medical journal Lancet. „It's confirmed by numerous scientific papers,“ Mayer tells the audience. At 9:15 Mayer presents:

### **The short term effects on infrasound**

- pressure in the ears
- anxiety feelings
- dizziness
- exhaustion
- tiredness in the morning
- respiration disturbance

Also experiments have been done on animals, and results show profound impacts on their physiology and health, ranging from changes in hormone levels and immunological parameters to damage to lung tissue, Mayer shows. At 10:08 he presents:

### **The long term impacts of infrasound**

- chronic respiratory disorders
- chronic stress and sleep disorders from higher stress hormone levels
- emotional disorder, depression, burnout
- high blood pressure, heart disease

### **And the symptoms of infrasound illness:**

- depression
- irritability
- tension
- headache
- mental and physical exhaustion
- concentration and sleep disorders
- noise sensitization

All of this is caused the constant low pressure waves acting on the inner ear and fooling the body into thinking it is in motion when in fact it is not. Infrasound interferes with the body's natural biorhythms. Mayer concludes this results in infrasound from wind turbines being „a problem to be taken very seriously“.

## **Especially dangerous for pregnant women**

At the 15:50 mark Mayer reminds the audience that even European officials issued directives regulating infrasound and pregnant women, writing that *„they should not perform activities that could generate strong low frequency vibrations because they could increase the risk of a miscarriage or premature birth.“*

Mayer emphasizes that the effects of infrasound are not something imagined in people's heads, but are in fact very real. It is even diagnosed as an illness by doctors.

### **„Turbines should not even be in sight“**

Mayer blasts wind-turbine German government agencies for their refusal to acknowledge the very real health facts and for blindly following everything the wind lobby tells them. He cites medical expert Dr. Reinhard Bartsch of the Friedrich Schiller University in Jena (20:35):

*From today's level of knowledge wind turbines should be placed only far away from residential areas, and better: they should not even be in sight.“*

At the 21-minute mark Mayer presents major publications on infrasound. Studies by Thorne and Salt show that up to 40% of people are sensitive to infrasound and that the health of these people who live near wind parks is *„considerably and seriously affected (injured) by this noise,,.*

Finally, a Canadian review of 62 scientific publications appearing in the Canadian Journal of Rural Medicine concluded that industrial wind turbines have *„negative health impacts“* on people who live in their vicinity.

Mayer praises regulations on distances from homes in Canada and New Zealand, which restrict the construction of wind turbines to 4 and 3 km away respectively.

**He is incorrect on this, actual policy in most of Canada and New Zealand that says 40 dBA at homes but approval boards let them be located 500 meters (approx) from homes with restrictions preventing affected people or communities from pursuing legal relief in Ontario. (R. James note)**



**From:**  
**To:** [Committee, EC \(SEN\)](#)  
**Subject:** sen.madigan@aph.gov.au  
**Date:** Thursday, 1 November 2012 9:51:57 PM

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## **Submission RE: Renewable Energy (Electricity) Amendment (Excessive Noise from Wind Farms) Bill 2012**

**Dr. Wayne J. Spring**

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Dear Senators,

I support the provisions of this bill. I am concerned about the impact of unregulated noise pollution on people close to the wind farms. If noise pollution is occurring, and people's sleep and health is suffering as a result, the proposed amendments will at least help to detect it.

As a Sleep Physician, working in Ballarat in Western Victoria, I have already been seeing patient from Waubra, Leonard's Hill, Glenthompson and Cape Bridgewater who have disturbed sleep which has coincided with the commencement of operation of nearby wind farms. I do not believe that we yet know the full extent of the consequences to these people of their exposure to wind farms or even the cause of the untoward effects which may not just be from "noise". Nonetheless, assessment of noise is a start in the monitoring of what is going on.

I am happy to attend the Senate inquiry and answer questions in person depending on the day or alternatively appear by video link.

Yours Sincerely,

Dr Wayne Spring M.B., B.S., F.R.A.C.P., F.R.C.P..

CONSULTANT PHYSICIAN.