From: valeriechristina@rocketmail.com [mailto:valeriechristina@rocketmail.com]
Sent: Tuesday, July 29, 2014 1:19 PM
To: Puco ContactOPSB
Subject: NASA Aerospace Engineer

Dear OPSB,

Please docket case #13-0990-EL-BGN.

Statement from a NASA Aerospace Engineer regarding the attachments also found in this email.

Please docket, along with attachments, in color. (As was done with windlab's "NEW DETRACTORS" map.
The color is significant.

"The focus on low frequency noise generation and infrasound is correct, as this is the frequency range which is most effective at transferring energy over long distances and the frequency range most annoying/harmful to humans." -James R. Scott, PhD, Notre Dame, NASA Senior Research Scientist, Retired.

Sincerely,

Valerie C. Malicki, MA, LPCC

From: Jim Scott <JimScottinBay@aol.com>;
To: 'Valerie Malicki' <valeriechristina@rocketmail.com>;
Subject: RE: In your expert opinion...
Sent: Tue, Jul 29, 2014 4:56:52 PM

Hi Valerie,

After reading through your emails and numerous attachments, I must say you have assembled some very impressive information and documentation regarding the wind turbine noise issue. I strongly encourage you to present this information to public officials and members in your community. I can vouch for its use of standard and accepted terminology and practice within the engineering and scientific communities. The focus on low frequency noise and infrasound generation is correct, as this is the frequency range which is most effective at transferring energy over long distances and the frequency range most annoying/harmful to humans.

As I mentioned in our conversation, my own background is in applied mathematics and computational fluid dynamics/ aeroacoustics. I worked in these fields during my entire 28-year career at the NASA Glenn Research Center. I also served as one of NASA's technical advisors to the National Wind Technology Center in 2003-2004 in evaluating university proposals for developing computational aeroacoustic software for modeling wind turbine noise.

Thanks for taking the time to let me know what's going on in your community. Good luck in your efforts to inform residents and public officials about all the issues involved in the wind turbine proposal.

James R. Scott

NASA Senior Research Scientist, Retired

Ph.D., Aerospace Engineering, University of Notre Dame, 1990

M.S., Applied Mathematics, Purdue University, 1982

Tel: 207-892-6691 **S.E. Ambrose & Associates** Email; seaa@myfairpoint.net
15 Great Falls Road, Windham, ME 04062
Acoustics, Environmental Sound & Industrial Noise

December 8, 2013

Theodore P. Hartke, PE, PLS
Hartke Engineering and Surveying, Inc.
117 S. East Avenue P.O. Box 123
Ogden, Illinois 61859

Ref: California Ridge Wind Turbine, Illinois

Dear Ted,

My name is Stephen Ambrose and I have over 35 years' experience performing environmental noise assessments for industrial and commercial facilities. My clients need to operate as a good acoustical neighbor to all nearby residential properties. I am a Board Certified Member of the Institute of Noise Control Engineering (INCE) and Member of the Acoustical Society of America (ASA).

Robert Rand (INCE) and I have worked together since we first met at Stone & Webster Engineering in the 1980's. For the past four years, we have been investigating industrial wind turbine audible and inaudible (infrasound) noise levels. We have identified why there are so many neighbor complaints involving excessive noise levels and adverse health impacts affects; sleep interference, headaches, nausea, vertigo, impaired cognitive ability, and more.

The only noise reduction option for wind turbines is to limit size or impose greater setback distance. This is especially true in quiet rural environments where there are no other man-made noise sources. Quiet areas need setback distances greater than a few thousand feet, but rather a mile or more. This is supported by research gathered from 55 environmental noise studies, which are summarized in the 1974 USEPA "Levels Document" (550/9-74-004). Research in 2004 by Pederson and Waye and the World Health Organization (WHO) 2009 Health Effect Guidelines are consistent with the USEPA recommendation when the noise levels are 'normalized' for quiet environments. This is all shown on Figure 1, which can be used to predict the range of public reactions to new noise source such as wind turbines.

Neighbors respond to the sound level increase and change frequency content. The public or community reaction is easily determined by locating the turbine noise level (dBA predicted or measured) on the 'x-axis' and the response is on the 'y-axis' when the black squares are intersected. Fifty 50 dBA exceeds and meets the black squares representing "*strong appeals to stop noise*" and "*vigorous community action*". Forty-five dBA has "*widespread complaints*" and "*strong appeals to stop noise*", 35 dBA has "*widespread complaints*" and "*sporadic complaints*". The design goal should be no louder than 32 dBA for "*no reaction*" or "*sporadic complaints*" at the worst.

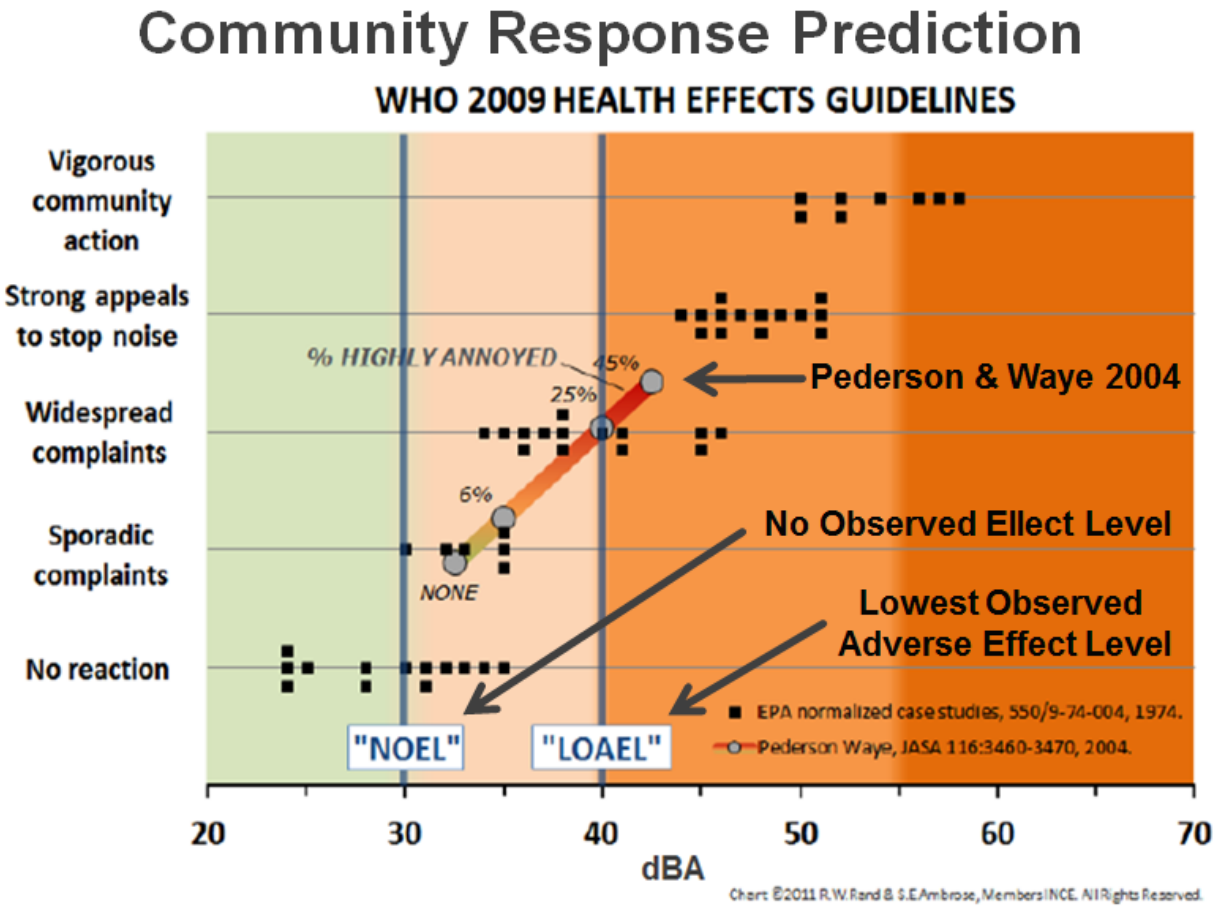
This chart clearly shows that your family is being exposed to excessive noise and adverse health impacts. Please feel free to call me with any questions.

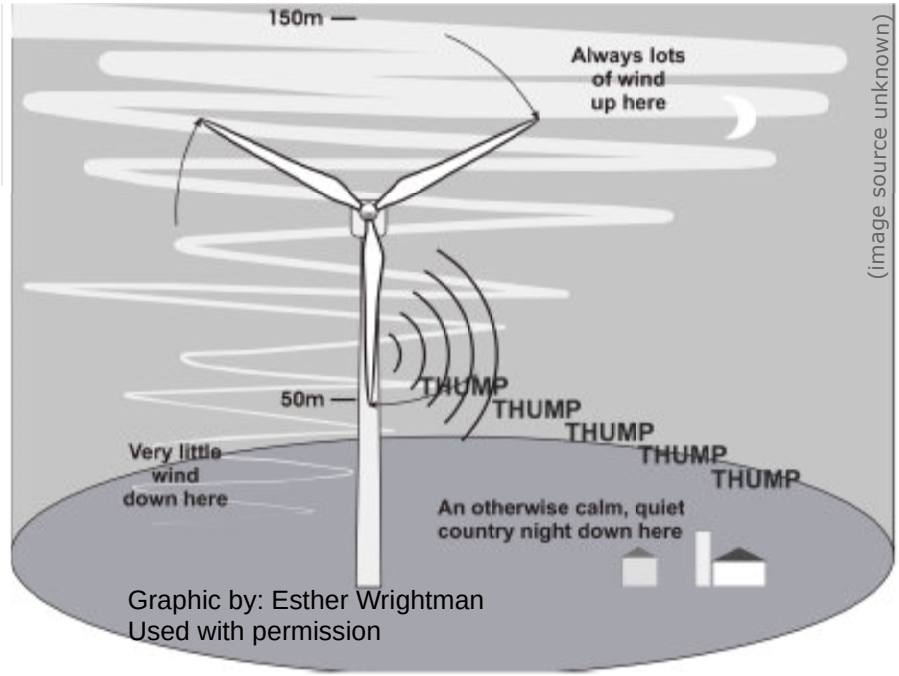
Respectfully,

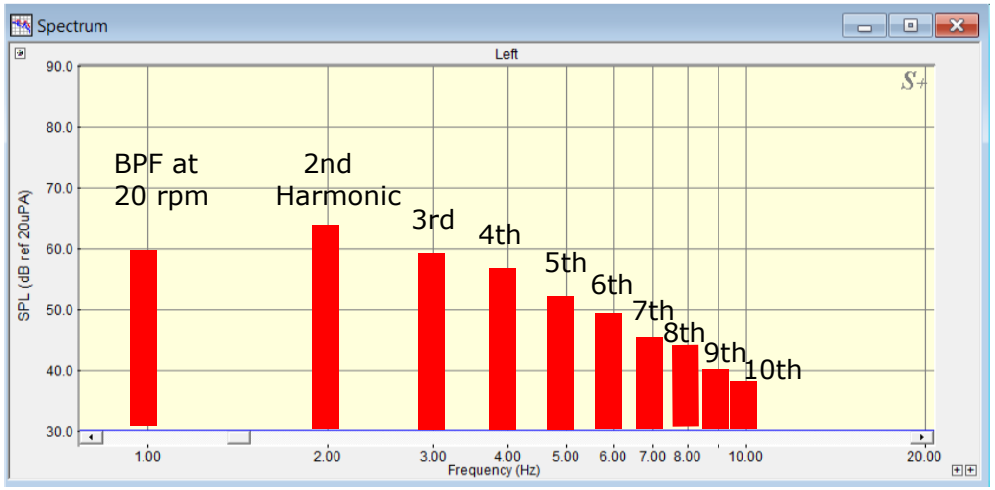
Stephen E. Ambrose

Stephen E. Ambrose, *INCE, Board Certified*
Principal Consultant

Tel: 207-892-6691 **S.E. Ambrose & Associates** Email; seaa@myfairpoint.net
15 Great Falls Road, Windham, ME 04062
Acoustics, Environmental Sound & Industrial Noise







As the blade passes the tower, the low frequency noise and infrasound is generated at a frequency related to the hub's rotation and number of blades. These pressure pulsations appear as tones during analysis but are not heard as tones by most people. Instead they may feel the pressure changes as pulsations, internal organ vibrations, or as a pain (like ear aches or migraines).

This frequency is called the Blade Pass Frequency often abbreviated as BPF.

For modern utility scale wind turbines this frequency is at 1 Hz or lower. A three bladed wind turbine with a hub rotation of 20 revolutions per minute (rpm) has a BPF of 1Hz. This means there is a pressure pulsation emitted into the community once every second. At 15 rpm the BPF is 0.75 Hz and at 10 rpm, 0.5 Hz.

When wind turbine blades rotate past the tower a a short pressure pulse (top graphic) occurs producing a burst of infrasound.

When analyzed the result is a well defined array of tonal harmonics below 10 Hz.
(red bars in figure above)

For impulsive sound of this type the harmonics are all "phase-correlated." This means the peaks of each occur at the same time. Thus, the peaks add together in a linear fashion with their individual maximum sound pressures all coinciding.

Thus, for an impulse having 4 equal amplitude harmonics (BPF, 2nd, 3rd and 4th) each of the same amplitude, the peak level is +12 dB.

10 equal harmonics would produce a peak level of +20 dB.

NINA PIERPONT M.D. PH.D.

June 30, 2014

Ms. Esen Fatma Kabadayi-Whiting
Cesme Belediyesi (Municipality)
İnönü Mah. 2001 Sk. No: 2 Çeşme / İZMİR
Turkey

Dear Ms. Kabadayi-Whiting,

I write to you at the request of Madeleine Kura, who tells me the charming, historical town of Cesme is about to have half a dozen 3 MW industrial wind turbines built on the edge of town, a mere 500 m from people's homes. (I'm told that at least one of the turbines will be 300 m from a school.) Furthermore, all this construction will be in hilly terrain.

Let me explain, clinically, why this is a bad idea. In 2009 I published what was then the definitive study of health effects caused by wind turbine infrasound on people living within 2 km of industrial turbines. The book, "Wind Turbine Syndrome: A Report on a Natural Experiment" (K-Selected Books), included 60 pages of raw data in the form of case histories (using case cross-over studies), demonstrating that living in proximity to wind turbines dys-regulates the inner ear vestibular organs controlling balance, position, and spatial awareness. Effectively, sufferers experience symptoms of sea-sickness, along with several related pathologies.

It turns out all this has been well known since the 1980s, when the US Department of Energy commissioned a report on wind turbine health effects — the report subsequently published by physicist Dr. N D Kelley and his colleagues at the Solar Research Institute in Golden, Colorado, bearing the title, "A Methodology for Assessment of Wind Turbine Noise Generation," *Transactions of the American Society of Mechanical Engineers*, v. 104 (May 1982), pp. 112-120.

> In this paper we have presented evidence to support the hypothesis that one of the major causal agents responsible for the annoyance of nearby residents by wind turbine noise is the excitation of highly resonant structural and air volume modes by the coherent, low-frequency sound radiated by large wind turbines.

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> Further, there is evidence that the strong resonances found in the acoustic pressure field within rooms [in people's homes] . . . indicates a coupling of sub-audible energy [infrasound] to human body resonances at 5, 12, and 17-25 Hz, resulting in a sensation of whole-body vibration (p. 120).

I discovered the same thing in my research. What Kelly et al. refer to as a "sensation of whole-body vibration," I refer to as Visceral Vibratory Vestibular Disturbance (VVVD): "The internal quivering, vibration, or pulsation and the associated complex of agitation, anxiety, alarm, irritability, tachycardia, nausea, and sleep disturbance together make up what I refer to as Visceral Vibratory Vestibular Disturbance (VVVD)" ("Wind Turbine Syndrome," p. 59).

Five years later, Dr. Kelley gave a follow-up paper at the Windpower '87 Conference & Exposition in San Francisco, titled "A Proposed Metric for Assessing the Potential of Community Annoyance from Wind Turbine Low-Frequency Noise Emissions." Just so you understand the terminology, "emissions" means "noise & vibration." And the term "low frequency" includes infrasound. And the antiseptic phrase "community annoyance" is code for Wind Turbine Syndrome — except the name had not been coined in1987. (I created it decades later.) Kelley's research once again had been funded by the US Department of Energy, Contract No. DE-AC02-83CH10093.

> We electronically simulated three interior environments resulting from low-frequency acoustical loads radiated from both individual turbines and groups of upwind and downwind turbines. . . .
>
> Experience with wind turbines has shown that it is possible . . . for low-frequency acoustic noise radiated from the turbine rotor to interact with residential structures of nearby communities and annoy the occupants. . . .
>
> The modern wind turbine radiates its *peak* sound power (energy) in the very low frequency range, typically between 1 and 10 Hz [i.e., infrasound]. . . .
>
> Our experience with the low-frequency noise emissions from a single, 2 MW MOD-1 wind turbine demonstrated that . . . it was possible to cause annoyance within homes in the surrounding community with relatively low levels of LF-range [low frequency range] acoustic noise. An extensive investigation of the MOD-1 situation revealed that this annoyance was the result of a coupling of the turbine's impulsive low-frequency acoustic energy into the structures of some of the surrounding homes. This often created an annoyance environment that was frequently confined to *within the home itself* (p. 1, emphasis in original).

I am attaching a copy of Kelley's 1987 paper.

Besides my research, which pretty much duplicates Kelley's, there is the work of Dr. Alec Salt, Professor of Otolaryngology in the School of Medicine at Washington University (St. Louis, Missouri), where he is director of the Cochlear Fluids Research Laboratory.

Professor Salt is a highly respected neuro-physiologist specializing in inner ear disorders and in particular the mysteries of the cochlea.

Prof. Salt's research dovetails with mine and with Dr. Kelley's. For many years, acousticians and noise engineers have vigorously maintained that "if you can't hear it, it can't hurt you." That is to say in the case of wind turbines, "If you can't hear the low-frequency noise in the infrasound range, it can't hurt you." (Infrasound, by definition, is noise below the hearing threshold, typically pegged at 20 Hz and lower. People feel infrasound in various parts of the body, though typically they cannot hear it.) In any case, Professor Salt and his colleagues have demonstrated conclusively, definitively, that infrasound does in fact disturb the very fine hair cells of the cochlea.

With this discovery, one of the main arguments advanced by the wind energy industry — namely, that wind turbine infrasound was too low to be harmful to people, since they could not hear it — was demolished. Prof. Salt has proven that, "If you can't hear it, it can still harm you."

This past winter, Professor Salt and his colleague, Professor Lichtenhan, published "How Does Wind Turbine Noise Affect People?" *Acoustics Today,* v. 10 (Winter 2014), pp. 20-28. The following is a lengthy excerpt:

> The essence of the current debate is that on one hand you have the well-funded wind industry (1) advocating that infrasound be ignored because the measured levels are below the threshold of human hearing, allowing noise levels to be adequately documented through A-weighted sound measurements; (2) dismissing the possibility that any variants of wind turbine syndrome exist (Pierpont 2009) even when physicians (e.g., Steven D. Rauch, M.D. at Harvard Medical School) cannot otherwise explain some patients' symptoms; and (3) arguing that it is unnecessary to separate wind turbines and homes based on prevailing sound levels.
>
> On the other hand, you have many people who claim to be so distressed by the effects of wind turbine noise that they cannot tolerate living in their homes. Some move away, either at financial loss or bought-out by the turbine operators. Others live with the discomfort, often requiring medical therapies to deal with their symptoms. Some, even members of the same family, may be unaffected. Below is a description of the disturbance experienced by a woman in Europe we received a few weeks ago as part of an unsolicited e-mail.
>
> > From the moment that the turbines began working, I experienced vertigo-like symptoms on an ongoing basis. In many respects, what I am experiencing now is actually worse than the 'dizziness' I have previously experienced, as the associated nausea is much more intense. For me the pulsating, humming, noise that the turbines emit is the predominant sound that I hear and that really seems to affect me.
> >
> > While the Chief Scientist [the person who came to take sound measurements in her house] undertaking the measurement informed me that he was aware of the low frequency hum the turbines produced (he lives close to a wind farm himself, and had recorded the humming noise levels indoors in his own home) he advised that I could tune this noise out and that any adverse symptoms I was experiencing were simply psychosomatic. . . .

> Given the knowledge that the ear responds to low frequency sounds and infrasound, we knew that comparisons with benign sources were invalid and the logic to A-weight sound measurements was deeply flawed scientifically. . . .
>
> From this understanding we conclude that very low frequency sounds and infrasound, at levels well below those that are heard, readily stimulate the cochlea. Low frequency sounds and infrasound from wind turbines can therefore stimulate the ear at levels well below those that are heard. . . .
>
> No one has ever evaluated whether tympanostomy tubes alleviate the symptoms of those living near wind turbines. From the patient's perspective, this may be preferable to moving out of their homes or using medical treatments for vertigo, nausea, and/or sleep disturbance. The results of such treatment, whether positive, negative, would likely have considerable scientific influence on the wind turbine noise debate....
>
> Another concern that must be dealt with is the development of wind turbine noise measurements that have clinical relevance. The use of A-weighting must be reassessed as it is based on insensitive, Inner Hair Cell (IHC)-mediated hearing and grossly misrepresents inner ear stimulation generated by the noise. In the scientific domain, A-weighting sound measurements would be unacceptable when many elements of the ear exhibit a higher sensitivity than hearing. The wind industry should be held to the same high standards. Full-spectrum monitoring, which has been adopted in some reports, is essential. . . .
>
> Given the present evidence, it seems risky at best to continue the current gamble that infrasound stimulation of the ear stays confined to the ear and has no other effects on the body. For this to be true, all the mechanisms we have outlined (low frequency-induced amplitude modulation, low frequency sound-induced endolymph volume changes, infrasound stimulation of type II afferent nerves, infrasound exacerbation of noise-induced damage and direct infrasound stimulation of vestibular organs) would have to be insignificant. We know this is highly unlikely and we anticipate novel findings in the coming years that will influence the debate.

I suspect you are beginning to get a clear picture of the problem — and why I'm writing to you.

The typical symptoms of what is now known worldwide as Wind Turbine Syndrome are: sleep disturbance, headache, tinnitus (ringing or buzzing in the ears), ear pressure, dizziness (a general term that includes vertigo, light-headedness, sensation of almost fainting, etc.). nausea, visual blurring, tachycardia (rapid heart rate), irritability, problems with concentration and memory, and panic episodes associated with sensations of internal pulsation or quivering which arise when awake or asleep.

Does everybody living near wind turbines experience Wind Turbine Syndrome? By no means! What I discovered is that people with (a) motion sensitivity, (b) migraine disorder, (c) the elderly (50 years and older), (d) inner ear damage, and (e) autistic children and adults — all these are at statistically significant high risk.

The solution is simple: industrial wind turbines must be set back, well away from people's homes, schools, places of work, and anywhere else people regularly congregate. In my 2009 report, I recommended a minimum setback of 2 km in level terrain. Studies done around the world since then have persuaded me that 2 km is not sufficient, especially in hilly or mountainous terrain — as with Cesme. In Cesme's case, setbacks should be more on the order of 5 km or greater.

Hence my alarm when notified by Ms. Kura that Cesme is considering 500 m (or less) setbacks. This is wholly inadequate. I guarantee that, unless the setbacks are increased substantially, there will be numerous victims of Wind Turbine Syndrome.

There's more. Dr. Salt referred to Dr. Steven Rauch, above. Dr. Rauch, a physician, is the Medical Director of Harvard Medical School's renowned Clinical Balance and Vestibular Center, part of the Massachusetts Eye & Ear Infirmary. Dr. Rauch was recently interviewed by The New Republic:

> Dr. Steven Rauch, an otologist at the Massachusetts Eye and Ear Infirmary and a professor at Harvard Medical School, believes WTS [Wind Turbine Syndrome] is real. Patients who have come to him to discuss WTS suffer from a "very consistent" collection of symptoms, he says. Rauch compares WTS to migraines, adding that people who suffer from migraines are among the most susceptible to turbines. There's no existing test for either condition but "Nobody questions whether or not migraine is real."
>
> "The patients deserve the benefit of the doubt," Rauch says. "It's clear from the documents that come out of the industry that they're trying very hard to suppress the notion of WTS and they've done it in a way that [involves] a lot of blaming the victim" ("Big Wind Is Better Than Big Oil, But Just as Bad at P.R.," by Alex Halperin in *The New Republic*, June 16, 2014).

Dr. Rauch made a similar statement to ABC News last fall.

I met with Dr. Rauch in Cambridge, Mass., several years ago. He has read my "Wind Turbine Syndrome" book. You're welcome to contact him for his clinical opinion. Notice, he actually treats WTS victims, and furthermore his specialty is neuro-otology — precisely the clinical specialty appropriate to WTS, since WTS is mainly a vestibular disorder. (You might consider Dr. Rauch the "pope" of vestibular disease.)

Shifting gears, a group of mechanical engineers at the University of Minnesota recently mapped the airflow turbulence patterns of a 2.5 MW wind turbine. Their technique was ingenious: "A large searchlight with custom reflecting optics generated a two-dimensional light sheet next to the 130-m-tall wind turbine for illuminating the snow particles in a 36-m-wide by 36-m-high area." They literally mapped the vortices being hurled off the turbine blades, using a blizzard (!) as a kind of background screen. Visit this website to see and savor the dramatic results.

http://discover.umn.edu/news/science-technology/new-study-uses-blizzard-measure-wind-turbine-airflow

Click open the video and notice the pulsed pressure waves from the blades — punching holes, as it were, in the swirling snow. You can watch the video on YouTube: http://www.youtube.com/watch?v=OHl_0s4qqUY.

Think of volleys of acoustic artillery, much of it in the low frequency and infrasound range. Imagine the residents of Cesme being bombarded by this day and night.

You are looking at the huge, pulsed, sound pressure waves responsible for Wind Turbine Syndrome.

Ms. Kura tells me the turbines destined for Cesme are 3 MW. Several years ago, the noted Danish noise engineer, Professor Henrik Moller at Aalborg University, published a paper titled "Low-Frequency Noise from Large Wind Turbines," *Journal of the Acoustical Society of America*, vol. 129, no. 6 (June 2011), pp. 3727-3744. Moller and his colleague, Christian Sejer Pedersen, demonstrated that "the larger the turbine, the greater the ILFN (infrasound and low frequency noise) produced." The following is the abstract of their paper.

> As wind turbines get larger, worries have emerged that the turbine noise would move down in frequency and that the low-frequency noise would cause annoyance for the neighbors. The noise emission from 48 wind turbines with nominal electric power up to 3.6 MW is analyzed and discussed.
>
> The relative amount of low-frequency noise is higher for large turbines (2.3–3.6 MW) than for small turbines (2 MW), and the difference is statistically significant. The difference can also be expressed as a downward shift of the spectrum of approximately one-third of an octave.
>
> A further shift of similar size is suggested for future turbines in the 10 MW range.
>
> Due to the air absorption, the higher low-frequency content becomes even more pronounced when sound pressure levels in relevant neighbor distances are considered.
>
> Even when A-weighted levels are considered, a substantial part of the noise is at low frequencies and, for several of the investigated large turbines, the one-third octave band with the highest level is at or below 250 Hz.
>
> It is thus beyond any doubt that the low-frequency part of the spectrum plays an important role in the noise at the neighbors.

Given all of the above, you can see why I am concerned for the residents of Cesme.

A final word. The clinical literature, including publications by the World Health Organization on health effects from infrasound exposure, typically use the word that Dr. Kelley used in his reports to the US Department of Energy — "annoyance." It's really not an appropriate word. It vastly understates the sickness caused by infrasound exposure.

(A mosquito bite is an annoyance. Wind turbine infrasound, on the other hand, triggers a debilitating cascade of illnesses whose features I enumerated, above.)

In medicine, we clinicians are morally bound to exercise what's called the "precautionary principle." That is, if we don't know for certain that a procedure is harmless, we are obliged to exercise extreme caution in performing the procedure, in this instance building industrial wind turbines — which are well-known to produce impulsive (i.e., amplitude-modulated) infrasound — near people's homes. This is, after all, common sense.

For decades, the wind industry flatly denied their turbines produced infrasound. It took monumental efforts by people like me to debunk this fallacy. Wind industry advocates likewise argued that only downwind turbines created noise, that is, low-frequency noise. Dr. Kelley and his research team effectively debunked that falsehood, in the articles referred to above. Finally, the wind industry clung to the fiction that, "If you can't hear it, it can't hurt you." Professor Salt deflated that one.

It's time to recognize that the global wind industry has hidden behind a series of (what turned out to be) falsehoods. Their untruths have been exposed and corrected in the published clinical and scientific literature, as shown above.

There is no excuse for building wind turbines in proximity to people's homes.

Sincerely,

Nina Pierpont, M.D.*, Ph.D.**

*M.D. from The Johns Hopkins University School of Medicine
**Ph.D. from Princeton University in Population Biology/Evolutionary Biology/Ecology
***B.A. (Biology, with honors), Yale University

Tel: 207-892-6691
seaa@myfairpoint.net

Stephen E. Ambrose

15 Great Falls Road
Windham, ME 04062, USA

Education:

1973-75	**University of Massachusetts**, Amherst, MA	B.S. Civil Engineering
1971-73	**Cape Cod Community College**, Barnstable, MA	A.A. Math/Science

Professional:

1978	**Institute of Noise Control Engineering**	Full Member 1981/Board Certified 1993
1981	**Acoustical Society of America**	Full Member

Expert Testimony:

Wind Turbine Noise Technical Advisory Group (WNTAG), Massachusetts Department of Environmental Protection, Boston, MA, June 2013 to December 2013

Wind turbine peer-review, Remanded Court Decision to the Town of Charlestown Zoning Board of Review, Charlestown, RI, June 2013.

Wind turbine legislation re: S 30 Vermont House Committee on Natural Resources and Energy, April 18, 2013, Montpelier, VT.

Wind turbine moratorium legislation re: S. 30 and S.21, Vermont Senate Natural Resources & Energy Committee, January 31, 2013, Montpelier, VT.

Wind turbine adverse health effects, Environmental Review Tribunal Hearing**,** Ministry of the Environment June 15, 2012, Ontario, Canada.

Community noise impact assessment, Maine Senate Environmental and Natural Resources Committee, February 8, 2012, Augusta, ME.

Published Professional Reports:

Falmouth, Massachusetts wind turbine infrasound and low frequency noise measurement; Inter-Noise 2012, Session 325, 10-02, New York City, NY, August 19-22, 2012, Stephen Ambrose, Robert Rand, Carmen Krogh.

Wind Turbine Acoustic Investigation: Infrasound and Low-frequency Noise – Case Study, Bulletin of Science Technology & Society, August 22, 2011, 0270467611417849, Stephen Ambrose, Robert Rand, Carmen Krogh.

Occupational Health and Industrial Wind Turbines: A Case Study, Bulletin of Science Technology & Society, August 22, 2011, 0270467611417849, Robert Rand, Stephen Ambrose, Carmen Krogh.

Noise ordinance design: mapping by land use, Noise-Con 2007, Reno Nevada, October 22-24, 2007, Robert Rand, Stephen Ambrose, Caroline Segalla.

Published White Paper:

The Bruce McPherson Infrasound and Low Frequency Noise Study, For Christopher Senie & Associates, Westborough, MA December 14, 2011, Stephen E. Ambrose, Robert W. Rand

Professional Reviews - industrial wind turbines:

Independent Peer-review – Douglas Woods Wind Farm, Douglas, Massachusetts, Report to Brian Swartz, Esq., Senie & Associates, P.C., Westborough, MA, July 26, 2013, Stephen Ambrose, Robert Rand.

Independent Peer-review – Saddleback Ridge Wind Farm, Carthage, Maine, Report to Rufus Brown, Esq., Brown & Burke, Portland, ME, June 28, 2013, Stephen Ambrose, Robert Rand.

Acoustic Analysis Report – Whale Rock Wind Development Project – Charlestown, RI, Report to John Mancini Esq., MAK Law Offices, Providence, RI, June 4, 2013.

Acoustic Analysis Report – Environmental Sound Level Assessment – The Rte. 44 Stop & Shop Wind Project, Report to David Paliotti, Greenbaum, Nagel, Fisher & Paliotti, LLP, Boston, MA, March 13, 2013, Stephen Ambrose, *Hoosac Wind Project*, Letter to Kenneth Kimmell, Commissioner, Massachusetts Department of Environmental Protection, Boston, MA, September 12, 2012, Stephen Ambrose, Robert Rand.

Vermont Noise Monitoring Plan, Sheffield Wind Project Operational Sound Level Compliance Test - Wintertime Conditions, Sheffield Wind Project Operational Sound Level Compliance Test - Springtime Conditions, letter to Annette Smith, Executive Director, Vermont for a Clean Environment, Inc., Danby, VT.

Anderson Cranberries Wind Project, Letter to Marilyn Byrne, Plymouth Zoning Board of Appeals, Plymouth, MA, February 7, 2012, Stephen Ambrose, Robert Rand.

Madaket Wind Turbine Acoustic Analysis, letter to Common Sense Nantucket, February 1, 2012, Robert Rand, Stephen Ambrose,

TTOR Wind Turbine Project, Cohassett, MA, Letter to Damon Seligson, DiNicola, Seligson & Upton, LLP, Boston, MA, April 19, 2012, Stephen Ambrose, Robert Rand.

Salem Wind Turbine Generator Study, letter to Christopher Senie & Associates, Westborough, MA, September 9, 2011, Stephen Ambrose, Robert Rand

Pisgah Mountain Wind Project, letter to Charles E. Gilbert III, Gilbert & Grief, P.A., Bangor, ME, April 12, 2011, Stephen Ambrose, Robert Rand.

Proposed Wind Energy Facility in the Town of Brewster Massachusetts, letter to Christopher Senie & Associates, Westborough, MA, January 6, 2011, Stephen Ambrose, Robert Rand.

Professional Experience:

2008-present **S.E. Ambrose & Associates** **Windham, ME**
1991 to 2008 part-time

Principal Consultant / Owner

- Wind turbine noise, infrasound and low frequency noise investigations to understand why neighbor complain and government agencies unable to protect public from adverse health impacts. Wind turbine application peer-reviews and community impact assessments.
- Acoustic measurements for noise source identification and mitigation. Noise compliance for workplace and community environments. Peer-reviews for states and municipalities. Public education, presentations, and guidance for municipal ordinances.

2001-2008 **Stone & Webster / A Shaw Group Company** **Stoughton, MA**

Senior Environmental Engineer

- Noise & vibration control responsibilities for industrial & power generation projects.
- Combustion turbine, reciprocating engine & compressor station evaluations.
- Community and environmental impact assessments, industrial noise investigations, and noise control feasibility and installation.

1994-2001 & 1989-91 **Tritek Inc.** **Lexington, MA**

Manager Instruments & Applications

- Manufacturer's rep for dynamic measurement, test, analysis, predictive maintenance & inspection instruments.
- Instruments; spectrum analyzers, time-wave form analyzers, data acquisition systems, multi-channel AM, FM & digital tape recorders, precision sound level meters, vibration sensors and transducers, and RF / microwave frequency components.
- Inspection; hi-resolution CCD cameras, SESI radio frequency eddy current analyzers and lubrication oil analysis service.

1976-89 & 1991-93 **Stone & Webster Engineering** **Boston, MA**

Senior Environmental Engineer

- Instrumentation Lab Manager, Noise Control Specialist, Vibration and Dynamic Measurement Specialist, Equipment and Station Start-up Engineer,
- In-situ measurements, evaluations & mitigation, in-house post-analysis & reports.
- Dynamic evaluations using spectrum, modal & finite element analysis, multi-channel data acquisition, predictive maintenance & related application programs.
- Dynamic & static sensors; acceleration, velocity, displacement, torque, acoustic, pressure, strain gage, & temperature.

Significant Projects:

Shoreham Nuclear Power Station

- Responsible for compliance vibration tests for major mechanical equipment prior to being accepted by the station owners.
- Solved 500 HP screen-well pump excessive vibration problems when vendor gave-up after 3 installs and 2 factory rebuilds. Improper mounting connections enabled the system to vibrate at a natural frequency excited by running speed imbalance.
- During the critical 900 MW steam turbine test, identified that a vibration was caused by a shaft-rider sensor was positioned above a defect that was not part of the bearing surface. Factory team could not clearly define the problem. The test was successful.
- Solved a long-term excessive vibration problems on a 500 HP screen-well pump after the vendor/installer gave-up in frustration after 3 installs, removing for 2 factory rebuilds. Problem corrected by stiffening mounting bracket so the pump would not excite a running speed natural frequency.
- Involved with identifying the cause for two emergency generator crankshaft failures.
- Performed the start-up vibration compliance tests for 2 V12 replacement emergency generators.

Chesterfield Power Station Unit 5

- This project replaced to top 70-ft of a very large-size 300-ft column with more than 100-tons of dead load.
- Responsible for 110 channels of strain and LVDT transducer system used to monitor structure stability during the critical 10 MW thermal jacking procedure to remove and replace top 70-ft of a main support column. Monitored for three weeks to determine the structural movement and load transfers caused by the summertime sun movement.
- Calculated building dead load transfers between main-support columns during dynamic thermal jacking. Preferred vs. telephone conversation with Boston engineering staff.

Massachusetts Water Resources Authority

- Developed a computer spreadsheet, prediction noise model to account for over 250 pieces of construction equipment moving about the site for over 10-years. Recommendations were made for installing noise control equipment, devices and techniques to comply with noise limits at several noise sensitive properties.

Tennessee Natural Gas / FERC

- Performed environmental noise impact assessments for expanding the northeast corridor capacity with more than 30 new or expanded combustion turbine compressor stations. Some station had to meet 40 dBA noise limits at 400-ft.

Boston Edison

- Performed 20 environmental noise assessments throughout Massachusetts to determine which sites would be feasible for new development or expanding existing electric power-generation facilities.

Volunteer:

1994-2005	Zoning Board of Appeals Windham, ME	Windham, ME
1993-2005	Ordinance Review Committee	Windham, ME

Military:

1967-1971	Search and Rescue Crew Member Radio/Navigator, Avionics Technician	U.S. Coast Guard

Summary: Public Comment of Ms. Valerie C. Malicki electronically filed by Mr. Matt Butler on behalf of Staff of OPSB