

A Critique of the CanWEA – AWEA Report:

Wind Turbine Sound and Health Effects An Expert Panel Review

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dated February 4, 2010
updated June 30, 2010
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As Industrial Wind Turbines (IWTs) get installed closer to homes, the reports of significant health problems suffered by neighbors have continued rolling in, now numbering in the hundreds, if not thousands. They come from all around the world, and are quite consistent. This issue has the potential to adversely affect the interests of the wind energy industry, so their lobbying groups - in North America the Canadian Wind Energy Association (CanWEA) and the American Wind Energy Association (AWEA) - joined forces to commission a Review, with the aims of convincing the powers that be that there is no need to proceed with an independent rigorous study of the health effects of IWTs.

Their Review can be found at <http://windfarmrealities.org/wfr-docs/canwea-health-dec-2009.pdf> (400kb). Their Executive Summary can be found on page 9 (their page ES-1) and finds, unsurprisingly, that there is “no evidence” of any “direct adverse physiological effects”. These results have been widely touted by the industry and their supporters as proof that IWTs are not harmful, and I understand that CanWEA has sent copies of this review to the Provincial governments and every local council (at least in Ontario).

For a large number of reasons this Review is not creditable, and this critique goes into some of the details behind that conclusion. This critique is divided into 5 sections.

- 1) Formation - an overview of how the Review and the panel were formed.
- 2) Major Failings - my look at the major failings of the Review.
- 3) Other Parties - a collection of commentary from other parties.
- 4) Details - a look at the Review in more detail.
- 5) Conclusions - parting words.

I haven't loaded this critique up with links to support my opinions, as they make it harder to read, plus they often don't work as I would like them to, pdf files and links being what they are. If you want to know what formed the basis of my opinions please take a look at my web site, <http://windfarmrealities.org>, which is replete with references for all this and more in the health section. Or if really curious, you can always email me.

Formation

The reason their Review was undertaken is given as follows (their page 1-1).

“Together AWEA and CanWEA proposed to a number of independent groups that they examine the scientific validity of recent reports on the adverse health effects of wind turbine proximity. Such reports have raised public concern about wind turbine exposure. In the absence of declared commitment to such an effort from independent groups, the wind industry decided to be proactive and address the issue itself.”

Their methodology for creating this Review included three steps (page 2-1).

“formation of an expert panel, review of literature directly related to wind turbines, and review of potential environmental exposures.”

The panel was made up of 7 members with lots of letters after their names, experts in a number of areas, with the notable exception of an epidemiologist. They were selected by CanWEA and AWEA. They apparently never actually met, instead had conference calls to discuss their findings. It is unclear who wrote what and who controlled the final product. It is unclear how they decided where to search for their information. From the Review, they only mention that they:

“conducted a search of Pub Med under the heading ‘Wind Turbines and Health Effects’ ... and ‘vibroacoustic disease’.”

Pub Med is maintained by the U.S. National Institutes of Health and can be accessed at <http://www.ncbi.nlm.nih.gov/pubmed/>. The Review’s reference section contains 126 references (assuming I counted right) that they used to reach their conclusions.

Their Review is divided into 6 sections with 5 appendices.

- 1) Introduction, 2 pages.
- 2) Methodology, 1 page.
- 3) Overview and Discussion, 17 pages.
- 4) Results, 15 pages.
- 5) Conclusions, 1 page.
- 6) References, 9 pages.

The appendices, all of which are short, are: Fundamentals of Sound, The Human Ear, Measuring Sound, Propagation of Sound and Expert Panel Members.

Major Failings

Even before leaving the first page (1-1) in the Introduction their integrity takes a major hit. From the sentences I quoted above they seem to be claiming to doing a public service with this Review. The problem is, CanWEA (with whom I'm more familiar) has consistently and publicly stated that no independent study is necessary (and they continue to do so in this Review), and I have every confidence they have argued the same in private with government officials who would have to fund any independent study. It is disingenuous to complain about the failure of independent groups to study the problem when you've been doing your best to make sure none of them will ever have the funds to do so.

The methodology section holds more clues to the real nature of this Review. One criticism they anticipated was that this was an Industry-sponsored report and thus bound to be biased. They counter this by stressing that the panel members were independent. How were the members selected, other than having lots of letters after their names? I am not familiar with five of the seven, but the two I am familiar with (Colby and Leventhall) have a long history of supporting the notion that IWTs do not create any health problems. The sponsors figured, correctly, that they could safely be given the independence to prepare this Review, knowing ahead of time what the results would likely be. Left unmentioned was the fact that the sponsors in case of a bad review might simply not publish it. One wonders if there have been other, less fortunate, reviews that have never seen the light of day.

Note that, again from the Methodology section, this panel apparently never met, having merely had "a series of conference calls". How were their references supplied - did they do their own investigation, or were the references supplied to them? Exactly how they came to include the 126 and exclude others is not revealed. The two searches on Pub Med as listed above yield a total of 39 hits, so there had to be some other supply of references. None of the panel went into the field and contacted any neighbors, victims or doctors. It is unclear if all, or any, of the panel members have even seen any of case studies of, say, Dr. Nissenbaum or Dr. Harry. It is unclear if any of the panel members read any of the reports by people like Dr. Hanning or Dr. McMurtry. None of these are part of their references. This Review (at least they had the integrity to call it a Review, as opposed to a study) is not a health study. It contains no new information. It is nothing more than a "literature review", and an incomplete one at that. It is doubtful that any of the panel members have ever spent any time living close to any IWTs, or even know anybody who has.

Their resulting conclusions are either weak or inconsistent with some of their own words. As an example of weakness, in the Executive Summary page, the first of three conclusions is

“There is no evidence that the audible or sub-audible sounds emitted by wind turbines have any direct adverse physiological effects.”

There are at least three problems with this one sentence. First is the “no evidence” statement. Actually there’s tons of evidence. They may not like the quality of that evidence, but I have to wonder exactly what sort of evidence they would like. After all, hundreds of consistent reports, gathered by doctors in the field, from all around the world, should count for something. Second, the “no evidence” is quite a weak disclaimer, used by just about every industry that produces something harmful to delay their day of reckoning. The third problem is the use of the word “direct”. All these noises can, and do, interfere with people’s ability to sleep, and that lack of sleep certainly leads to health issues, but are not “direct”. By this logic falling off a ladder is not a direct cause of injury; it’s the landing on the ground that is. I generally get more suspicious as the number of modifiers increases, as each modifier allows additional gaming with the parsing – and “effects” has 4.

An example of a conclusion that doesn’t follow from their own words is found in the Conclusion, section 6.

“Panel members agree that the number and uncontrolled nature of existing case reports of adverse health effects alleged to be associated with wind turbines are insufficient to advocate for funding further studies.”

That is immediately preceded by

“In the area of wind turbine health effects, no case-control or cohort studies have been conducted as of this date. Accordingly, allegations of adverse health effects from wind turbines are as yet unproven.”

I would think if there’s uncertainty you would want to undertake the studies necessary to resolve the uncertainty. It is almost as though one panel member wrote the sentences expressing the uncertainty, and some other member made sure the wind industry’s anti-study sentiments were expressed. Apparently in total the panel doesn’t want to bother with any actual studies, like the opponents (at least in Ontario) are requesting, and like the government of Japan is currently doing.

This conclusion is even more egregious given the number of comments from this Review that indicate there may be problems. Here’s a sampling.

“Softer sounds may be annoying or cause sleep disturbance in some people. At normal separation distances, wind turbines do not produce sound at levels that cause speech interference, but some people may find these sounds to be annoying.” (page 3-12)

“No scientific studies have specifically evaluated health effects from exposure to low frequency sound from wind turbines.” (page 3-17)

“Protracted annoyance, however, may undermine coping and progress to stress related effects. It appears that this is the main mechanism for effects on the health of a small number of people from prolonged exposure to low levels of noise.” (page 4-3)

So it must be the Panel’s conclusion that the neighbors are expendable. I don’t know of any other conclusion I can draw from their Report.

Other Parties

I’m not the only one who has problems with this Review. A number of others, both professionals and laypeople, have taken the time to look through this Review and make their comments on it. As I become aware of comments from others I’ll be adding them to this critique. I promise I’ll even add supporting comments as long as they come from disinterested parties with something intelligent to say. So far I haven’t come across any.

The Review mentions that so far the evidence for health problems is simply case studies, and how a cohort study would be needed as a next step, but then goes on to recommend no further studies are done. Quite disingenuous. Anyway, Dr. Nissenbaum has been doing a cohort study in Maine, and the initial summary of the numbers he presents are pretty scary, at:

<http://windfarmrealities.org/wfr-docs/nissenbaum-mars-hill-study-page-2.jpg> .

The UK’s National Health Service weighed in with their opinion after an article in the *Telegraph* wrote some unflattering things about the Review, at

<http://windfarmrealities.org/wfr-docs/nhs-review-critique.pdf> .

The Society for Wind Vigilance, which includes medical personnel as members, noticed the same failings as I did, as summarized at

<http://windfarmrealities.org/wfr-docs/soc-wind-vig-canwea-health-critique.pdf> with the details contained in

<http://windfarmrealities.org/wfr-docs/soc-wind-vig-canwea-health-table.pdf> .

Doctors McMurtry and Nissenbaum, although not named in the Review, were certainly in the line of fire from it. It didn’t take long for them to reply.

<http://windfarmrealities.org/wfr-docs/mcmurtry-response-canwea-health-study.pdf>

Doctor Pierpont was named (15 times by my count!) and a fair part of the report was devoted to disparaging her work in her recent book, *Wind Turbine Syndrome*. I haven’t seen a reply from her yet, but when and if it comes I’ll post it here.

Professor Persinger has experience with health studies that are inconvenient for the rich and powerful, and he adds some perspective.

<http://windfarmrealities.org/wfr-docs/persinger-dec-09.pdf>

In a follow-up letter Prof. Persinger provides some additional technical information about his concerns.

<http://windfarmrealities.org/wfr-docs/persinger-jan-10.pdf> .

Gary Chandler, a layman like myself, has collected a series of statements from the Review along with his responses. He noticed the same sorts of things I did. Smart boy!

<http://windfarmrealities.org/wfr-docs/chandler-layman-health-critique.pdf> .

One member of the panel was David Lipscomb. I suppose people have the right to change their minds, and Dr. Lipscomb certainly changed his since this earlier testimony of his in 2000.

<http://windfarmrealities.org/wfr-docs/lipscomb-testimony.pdf> .

The Acoustic Ecology Institute, at <http://www.acousticecology.org/> had some doubts about some of the Review's assertions, particularly that sleep disturbance was hardly mentioned; they were so busy trashing Pierpont's Wind Turbine Syndrome.

<http://windfarmrealities.org/wfr-docs/aei-canwea-awea-critique.pdf> .

Details

If what I've written so far hasn't led you into MEGO (My Eyes Glaze Over) territory, this section certainly will. While reading through the Review I noticed many statements that were of questionable merit – they were inaccurate or not relevant or misleading. As I get the time, I'll work my way through the Review and note those statements I think should be pointed out as being less than fully useful. All the italicized statements below are from sections 3, 4 and 5 and the appendices. In addition, I'll note each subsection and make at least a short comment on it, even if there's nothing controversial in it.

3-1. Wind Turbine Operation and Human Auditory Response to Sound. Four subsections, mostly a primer.

For comparison, the sound from a wind turbine at distances between 1,000 and 2,000 feet is generally within 40 to 50 dBA.

I assume this translates to 50dB at roughly 300 meters and 40dB at 600 meters. Notice the singular turbine, never a reality in a commercial project. In North America there is a long history of actual noise levels being above the pre-project calculations. One example can be found at:

<http://windfarmrealities.org/wfr-docs/ashbee-measurements.pdf>

A study in the United Kingdom (UK) also showed that only four out of about 130 wind farms had a problem with aerodynamic modulation and three of these have been solved (Moorhouse et al., 2007).

This reference is to the “Salford” study, during which no neighbors were contacted, and the source data was never released. I have more details on my site, at <http://windfarmrealities.org/wfr-docs/wg-salford-exam.pdf> .

3-2. Sound Exposure from Wind Turbine Operation. This section is very densely written, and I don’t have the background to evaluate it one way or another. For example, the explanation of Figure 3-3, on page 3-10, has me baffled. It also baffled John Harrison, a retired physics professor, who wrote this analysis: <http://windfarmrealities.org/wfr-docs/harrison-leventhall-critique.pdf> . It was clearly written by an acoustician. I had guessed Dr. Leventhall and was correct, as he used the same figure in his subsequent critique of Pierpont, at: <http://windfarmrealities.org/wfr-docs/leventhall-pierpont-critique.pdf> . An opposing view is from Dr. Alec Salt, an inner ear researcher at Washington University: <http://oto2.wustl.edu/cochlea/windmill.html> .

3-3. Potential Adverse Effects of Exposure to Sound. One paragraph each is spent on annoyance and sleep disturbance – the two most reported problems. Sleep disturbance in particular is just passed over. Nobody denies that these effects are present; rather, they are apparently regarded by this panel as not important.

3-4. Peer-Reviewed Literature Focusing on Wind Turbines, Low-Frequency Sound, and Infrasound. The studies of Pedersen et al are reviewed at length. These were NOT health studies; they focused on annoyance and found a lot of it.

No scientific studies have specifically evaluated health effects from exposure to low frequency sound from wind turbines.

And if this panel had its way, there wouldn’t ever be any.

4-1. Infrasound, Low-Frequency Sound, and Annoyance.

There is a consensus among acoustic experts that the infrasound from wind turbines is of no consequence to health.

I’d feel a lot better if there was consensus among medical personnel, not acousticians.

One particular problem with many of these assertions about infrasound is that is that the term is often misused when the concerning sound is actually low frequency sound, not infrasound.

This is Leventhall; he's been complaining about this "confusion" for years.

The entire paragraph at the top of page 4-2 is utter nonsense. What people complain about is a low frequency noise that pulses – like a neighbor's stereo bass – that goes on for hours, days, nights, weeks. You can't escape it; you can't control the environment in your own home. You can't protect your kids or pets from it. Notice that the Salford study is referenced again, and we already know that report never talked to a victim.

Jakobsen concluded that infrasound from wind turbines does not present a health concern.

Actually, he didn't. He's another acoustician, not a doctor. The only mention of anything that could be remotely be parsed to refer to health was, "Even quite close to these turbines the infrasound level is far below relevant assessment criteria, including the limit of perception. Such low infrasound levels are unimportant for the evaluation of the environmental effects of wind turbines." Note that "relevant assessment criteria" refers to a regulatory standard as opposed to a health standard.

There is no evidence that sound at the levels from wind turbines as heard in residences will cause direct physiological effects. A small number of sensitive people, however, may be stressed by the sound and suffer sleep disturbances.

A small number? How small is small? Note that no reference is given for this assertion. Dr. Nissenbaum's interviews in his small cohort study revealed that of 22 subjects within 3500 feet 82% suffered from sleep disturbance, including 5 who received prescriptions for it: <http://windfarmrealities.org/wfr-docs/nissenbaum-presentation-mars-hill.pdf> . Also note the subtle blaming of the victim.

So how does the panel explain the hundreds of complaints? *Three factors that may be pertinent to a short discussion of wind turbine annoyance effects are the nocebo effect, sensory integration dysfunction and somatoform disorders.* Why, it's all in their heads, put there in part by opponents. When the dogs are yelping, the horses ill at ease, both the adults and the kids puking, it isn't all in their heads. This is insulting. I am unaware of any doctor who has treated any victims blaming it on the nocebo effect.

4-2. Infrasound, Low-Frequency Sound, and Disease. This section attacks Alves-Pereira and Vibroacoustic disease. I don't know enough of the topic to comment.

Case reports need to be confirmed in larger studies, most notably cohort studies and case-control studies, before definitive cause and effect assertions can be drawn.

However, when I see a statement like this, I wonder why they continue to reject calls for studies.

4-3. Wind Turbine Syndrome. This section attacks Pierpont and Wind Turbine Syndrome. I don't know enough of the topic to comment. Much mention is made of the small sample size (10 families) but no mention is made of the longitudinal nature of her study, where she followed the families as they moved, and watched as their symptoms came and went.

The collective symptoms in some people exposed to wind turbines are more likely associated with annoyance to low sound levels.

However, when I see a statement like this, I wonder if whoever wrote this read what another panel member wrote about annoyance not being a health issue.

4-4. Visceral Vibratory Vestibular Disturbance. This section attacks Pierpont's second hypothesis, VVVD.

Whether implausible or not, there are time-tested scientific methods available to evaluate the legitimacy of any hypothesis and at this stage, VVVD as proposed by Pierpont is an untested hypothesis.

So why not test it?

4-5. Interpreting Studies and Reports.

Once suspicion of harm has been raised, controlled studies (case-control or cohort) are essential to determine whether or not a causal association is likely, and only after multiple independent-controlled studies show consistent results is the association likely to be broadly accepted (IARC, 2006).

A lot of people think enough suspicion has been raised, so let's get on with it. Dr. Nissenbaum has done a small cohort study as mentioned above, but notice that there's no mention of it in this report. Too inconvenient, I guess.

In the case of wind turbine noise and its hypothetical relationships to "wind turbine syndrome" and vibroacoustic disease, the weakest type of evidence—case series—is available, from only a single investigator.

The symptoms have been noted by numerous investigators, i.e. Nissenbaum and Harry. Note how carefully the sentence is constructed so that it refers only to Pierpont's hypotheses. What about sleep disturbance and annoyance/stress problems?

These reports can do no more than suggest hypotheses for further research. Nevertheless, if additional and independent investigators begin to report adverse health effects in people exposed to wind turbine noise, in excess of those found in unexposed groups, and if some consistent syndrome or set of symptoms emerges, this advice could change.

I think there's already sufficient evidence that this occurs, and what I and other opponents want is for the government to get serious about this and do the studies. I don't think that is asking too much.

4-6. Standards for Siting Wind Turbines. The panel sees no need for 1 mile setbacks, but they offer no reasoning to back this up. The remainder of this section really doesn't say much.

5. Conclusions. There are 4 conclusions, here in their entirety.

1. Sound from wind turbines does not pose a risk of hearing loss or any other adverse health effect in humans.

I don't know of any rationalization that can get from the contents of this Review to this sweeping conclusion. Throughout the Review there was mention of studies that have not been done. There was no significant mention of annoyance and stress, or sleep disturbance.

2. Subaudible, low frequency sound and infrasound from wind turbines do not present a risk to human health.

I don't know of any rationalization that can get from the contents of this Review to this sweeping conclusion. Throughout the Review there was mention of studies that have not been done.

3. Some people may be annoyed at the presence of sound from wind turbines. Annoyance is not a pathological entity.

I suppose this is where the "direct" health effect comes in. If annoyance leads to stress and sleep disturbances does that count? I think it would, but apparently the panel does not.

4. A major cause of concern about wind turbine sound is its fluctuating nature. Some may find this sound annoying, a reaction that depends

primarily on personal characteristics as opposed to the intensity of the sound level.

This is borderline insulting, trying to blame the victim. While there are differences among us, there are levels that almost everyone will object to. Wind turbines are capable of producing these levels.

Appendix **A**. Fundamentals of Sound.

Appendix **B**. The Human Ear.

Appendix **C**. Measuring Sound.

Appendix **D**. Propagation of Sound.

Appendix **E**. Expert Panel Members.

All these appendices are quite short, averaging one page each, and contain the most basic of information on their topics. I don't know enough about the human ear to comment on appendix B. For appendices A, C and D my web site has much better presentations of these topics than these appendices, under "Noise" and then "Basic Acoustics".

As an aside, I have to wonder about the panel's dynamics. Who among them wrote the most? Who set the tone? Who controlled their agenda? Who put together the final draft? While obviously I don't know the answers, my sense is that Leventhall was the lead guy, at least for Chapter 3, while Chapter 4 has a different tone. This Review contains a lot of acoustics but not much medicine, with a concentration on the mechanics of noise and how our auditory systems are built, but little on the potential human responses to noise. The writing style and content also strike me as consistent with his previous efforts. If I ever find out whether I'm right or wrong, I'll let you know.

Conclusion

Let's start from scratch. Numerous doctors from around the world have reported various noise-related problems with wind turbines. (1) Annoyance, (2) stress and (3) sleep disturbance are widely reported and hard to dismiss. In addition, two doctors (Alves-Pereira and Pierpont) have noticed additional problems and have proposed hypotheses – (4) VAD, (5) WTS and (6) VVVD to account for them. This Review was the wind industry's attempt to deny the existence of all these problems.

But what is not said is at least as important as what is said, and this review spends a great deal of time critiquing the last 3 while saying nothing of significance about the first 3. Everybody knows that wind turbines cause annoyance with the neighbors. Everybody knows that annoyance can lead to stress and sleep disturbance. Everybody knows that stress and sleep disturbance can lead to health issues. None of that is refuted in this Review. How does this Review mitigate these uncontested facts? With the weasel-like “no evidence” of “direct” harm. Annoyance? Sure, there's some, but it is too subjective to be studied. Stress? Nocebo and other psychobabble. Sleep disturbance? A small minority. And none of them are “direct”, at least if you parse the English language carefully enough.

Instead, the Review spends entire pages attacking the 3 hypotheses. I don't know enough to evaluate either the hypotheses or the critiques, but I have to ask myself, “Are these hypotheses at least plausible?” And if so, shouldn't any curious person want to investigate them further? Especially considering the potential harm, to thousands of people? In spite of numerous statements in the Review acknowledging that uncertainty, in the end they come down on the side of not investigating further. It would be interesting to ask each of the panel members to see if that is really the position they are advocating. But regardless of how history judges the three hypotheses, the remaining three issues are like the elephant in the room, an elephant the wind industry would rather not talk about too much.

This Review works very hard at looking authoritative and scientific. CanWEA and AWEA apparently are betting that for their intended audience the appearance itself will suffice, regardless of the actual (or rather, lack of) content. This Review is fatally compromised, and shame on those panel members who took part in this charade.