

The following is a transcript of the questions that were asked of Robert Rand, and his answers to those questions, during the Q & A session of the 9-12-17 Special Joint Meeting of the Brown County (Wisconsin) Human Services Committee and the Brown County Board of Health regarding wind turbine health concerns

(Note: Time notations are keyed to the meeting video found at: <https://www.youtube.com/watch?v=8bpc-pYMu48>)

Q & A Part 1

Questions from Brown County Supervisors and Brown County Board of Health

Questions for Robert Rand, Dr. Coussons, and Dr. McCunney 1:18:45

Can you describe your involvement in any original research on the topic of wind turbine adverse health effects? This would not include literature reviews.

Can you describe your involvement in any original research on the Shirley Wind project?

Robert Rand 1:19:11

In terms of original research my brand of work involves field measurements and surveys and correlation/association of neighbor reactions or complaints or reports to the noise that's observed. And, in that context, as a working professional consultant in noise control, that original research includes specific research in Falmouth for the Notus wind turbine in 2011, research on the Vader Piet facility in Aruba in 2012, research at the Shirley Wind farm in December of 2012 where we made direct field measurements and correlated it to neighbor complaints. So this is basic on-the-ground field study.

Question for Robert Rand 1:21:50

What did you think when you learned that the former Director of Brown County's Health department, Ms. Chua Xiong, stated that she experienced migraines when visiting the Shirley Wind Project?

Robert Rand 1:22:05

Well, at first I went, "That's great!", because she experienced exactly what I did when I worked there. If you look at the Table 1 in my attachment for the Shirley study you will see that. I reported headaches numerous times and these are unusual headaches. They weren't the kind of headaches I get if, let's say, if I worked too long and get dehydrated. I stayed very hydrated when I was at Shirley.

Question for Robert Rand 1:22:29

What did you think of her subsequent decision that she found no evidence to support a link between wind turbine noise and those types of symptoms?

Robert Rand 1:22:37

Well, I was appalled. I mean this is a Health Officer ostensibly in charge of protecting public health. And, the amount of data gathered and reported by the neighbors, the declaration of a Health Hazard, would seem to be, at least for a common sense level, to be something that would be actionable. I wrote a letter to Dr. Tibbetts, to the Board, stating that my professional judgment, which I sent to Chua Xiong earlier, was being overruled, and I had to do that as a member of INCE.

Question for Robert Rand 1:27:10

With regard to wind turbine sound energy emissions, please explain what is referred to as the nauseogenicity frequency range. Also, where do Shirley Wind's Nordex N100 wind turbines emissions fall within that range, and what are the potential adverse physiological effects for Shirley Wind residents exposed to those emissions?

Robert Rand 1:27:37

I introduced the term nauseogenicity in my attachment to the Shirley report that refers to the range identified by ISO 9996, which is 0.1 to 1 Hz. That's associated to motion sickness linked to perceived or actual oscillations in that range. The Nordex N100s fall within that range. What's called the blade pass frequency, which as I explained earlier, when the blade goes around, there are three blades, and as each one goes around it creates a pulse, and those pulse occurrences fall within that range. It can vary depending on the rotation rate. The highest rate is about, I believe, about .8 Hz and they can go down to about .2 Hz. I understand there is a maintenance rate. I'm not sure if Shirley uses them. I have seen this at other facilities where the blades are rotated by gearing at .2 Hz, or about 4 RPM to maintain the bearings. What are the potential adverse effects for residents? Well, I think the residents have reported unusual adverse effects, and by unusual I mean, as I experienced when I was studying there, unusual means feeling nauseous. I don't normally feel nauseous on a noise survey. Dizzy. I almost fell down at one point when I was inside one of the homes. I normally have pretty good balance. So, these are unusual things that I reported in my attachment. There are numerous affidavits from neighbors that report similar or problems such as headaches, nausea, dizziness, inability to concentrate. These are unusual physiological states, and yet they are all consistent with motion sickness.

Question for Robert Rand 1:29:40

According to Dr. McCunney's 2016 CV, he lives in Cohasset, MA. According to the current Town of Cohasset Wind Energy Conversion Facility Bylaw, noise emissions from large wind turbines are limited to 10 decibels over ambient, or normal background noise, at the property line, or 8 decibels over ambient, or normal background noise, at a residence. In contrast, the Town of Glenmore Wind Energy System ordinance that governs Shirley Wind allows noise up to 50 decibels, day and night, at the residence, while ambient, or normal background noise levels in this area, average just over 25 decibels at night during normal sleeping hours. If the Cohasset noise limits were enforced at Shirley Wind, night time noise levels would be limited to less than 35 decibels at the residence instead the present 50 decibels. This is a very, very large difference in both audible and ILFN noise levels. Would you say the noise limits in Dr. McCunney's hometown provide reasonable protection for public health? How about those at Shirley Wind?

Robert Rand 1:31:00

Yes, I would say a decibel, A weighted decibel limit of 35 provides a reasonable protection level. The 50 does not.

Question for Robert Rand 1:32:55

On June 19, 2017, Massachusetts Superior Court Justice Corneilius Moriarty issued his ruling regarding two wind turbines at Falmouth, Massachusetts, stating, "*The operation of Wind 1 and Wind 2 constitute a nuisance*" and "*It is further ordered that the Town of Falmouth cease and desist the operation of the wind turbines forthwith.*" You conducted ILFN testing at both Falmouth, Massachusetts and at Shirley Wind here in Brown County. In your opinion, do your findings and personal experience at Shirley Wind suggest that its wind turbines constitute an equal, or perhaps an even greater nuisance than the wind turbines at Falmouth that were ordered to be shut down?

Robert Rand 1:33:38

In both towns we have numerous residential affidavits complaining of symptoms that are consistent with motion sickness and sleep disturbance. And, the turbines in Falmouth are 82 meters in diameter and the turbines in Shirley are 100 meters in diameter. The Shirley turbines have longer blades. The sound pressures should be slightly higher. In fact they are. We found peak sound pressures in the homes between 90 and 100 dB unweighted inside the homes. I think a couple of times they were a little over that. And in Falmouth we found peak sound levels in the 70 to 80 range, something like that. So, that's consistent. The peak sound pressures during the pulsations, which look like a surge like this if you were to see them on an oscilloscope. They're a little higher in Shirley. They're bigger turbines. If the degree of impact is at least similar, and in the Falmouth case they've been in lawsuits for seven years and

just got a decision to shut the turbines down. The Shirley turbines have been involved in a continuous series of complaints and appeals to stop the noise for up to five years. So, the situations are certainly analogous.

Question for Robert Rand 1:39:35

The precautionary principle provides that if an action or policy has a suspected risk of causing harm to the public, in the absence of scientific consensus that the action or policy is not harmful, the burden of proof that it is not harmful falls on those taking that action. Considering the extensive library of peer-reviewed papers regarding the potential for adverse health effects from industrial wind turbines, do you find that the current scientific consensus of these papers is that industrial wind turbines do, or do not, pose risks of causing harm to the public, and do you believe that the wind industry has, or has not, fulfilled its burden of proof that wind turbines pose no risk of causing harm to the public?

Robert Rand 1:40:23

This is an interesting question. Thank you. The first part, do I find that the current scientific consensus of peer-reviewed papers that wind turbines do or do not pose risks. I'm not sure I see a scientific consensus because it depends on who is producing the papers, what their conclusions are in the papers, and sometimes the conclusions don't match the data that are in the papers. And so, it's difficult for me to look at the plethora of papers that are out there and say, oh, there's a scientific consensus. As a consultant in noise control engineering I have to look, and a member of INCE pledged to hold paramount the safety, health, and welfare of the public, I have to look at papers, and then when I see, and be properly educated, so I can inform my clients and those who have looked to me for professional advice. So when I see papers, and I conduct research myself, that where risks are clearly found, that develops a consensus for me to say we know that there are problems at certain distances, and at other distances we don't, and we are not yet seeing problems. So we have some basis for setting criteria for siting design. And, so, that first part of the question is, I would say, is not easy to answer, but in terms of providing planning I can clearly see very clear examples such as the Shirley study, the Pedersen-Waye data from 2004 and their subsequent amendments to that, that data lines up very well with the EPA case study suggested to quiet rural areas. So, there's very good correlation that in the range of the mid 30s, when it goes above that we're getting into problem areas, we're getting larger and larger percentages of people that are going to be affected. So we have a basis for setting criteria, which is what I do for work. For the second part of the question, which is, do you believe that the wind industry has or has not fulfilled its burden of proof that turbines pose no risk, that's an easy one. They definitely have not fulfilled their burden of proof that wind turbines pose no risk. We see lots of papers that say perhaps we're not seeing a problem, or we're drawing these conclusions, but even in the Health Canada study the conclusions don't match the data in their tables. So, we're not seeing a clear outline that says, ah, there is no risk. Now, with wind turbines, it's an issue, it's

location, location, location. If you're close to the turbines there is a risk. If you're thirty miles away from the turbine, there probably is no risk, and that's from my professional experience. So, it's really related to distance. And, we could say that more research is needed, but in the case of Falmouth and Shirley we have sufficient data to develop criteria for the wind turbines. We have neighbors reporting. I asked neighbors, how far away do you have to go to feel OK, and they came back the next day and said we have to be three and one half miles away. That was in 2012. We now have people reporting that they're not feeling well four miles away. That's almost five years later. I'm doing research in Colorado as well and the neighbors are reporting the same thing, about four miles away they start to get relief. So the relief is related to their feeling nausea, dizziness, inability to concentrate, and the other symptoms associated to motion sickness. So we're getting ground data from the experts, which are the neighbors. Their bodies are sensitive instruments and they are reporting the distances that they need. So we are getting criteria base information, information that is being used to develop criteria. So it's based on distance in my experience.

Question for Robert Rand 1:59:07

The December 2012 low frequency and infrasound study of three homes in the Shirley Wind project conducted by acousticians Walker, Schomer, Hessler, and yourself jointly concluded: *"The four investigating firms are of the opinion that enough evidence and hypotheses have been given herein to classify LFN and infrasound as a serious issue, possibly affecting the future of the industry. It should be addressed beyond the present practice of showing that wind turbine levels are magnitudes below the threshold of hearing at low frequencies."* Dr. McCunney's testimony is that if wind turbine infrasound is not above the threshold of hearing, then it cannot be perceived. Is that not directly opposite what the Shirley Team Report concluded?

Robert Rand 1:59:52

I would say it is directly opposite, where neighbors who can tell when the turbines are on and off, even though they can't hear them. In fact, at the end of the 2012 study, Paul Schomer came up with a plan to do a test. We would need Duke's cooperation to do that, to turn turbines on and off and have people report, well do they, are they feeling the sensations that they feel when the turbines are on, even though they can't hear them. We've been unable so far to get cooperation to do those tests. So, the evidence is available from the neighbor reports that they can tell when the turbines are on and off, even though they can't hear them. There is some form of sensation, which is a term used by Steven Cooper who did the Cape Bridgewater study, and he also found, there was a neighbor who was deaf in that study, and they were able to tell when the turbines were turning or not. So, there may be some sensory adaptation that happens, I understand, for deaf people. All he's saying, that's a little bit outside my field, but I hope that answers the question.

Question for Robert Rand, Dr. Coussons, and Dr. McCunney 2:04:12

I would like to ask the following question of Robert Rand, Dr. Coussons, and Dr. McCunney. Are you being financially compensated to speak at this meeting, and if you are, by whom?

Robert Rand 2:04:26

I am receiving no compensation. In fact, I've spent a fair amount of money to be here. I'm here to speak on behalf of our study and to respond appropriately to a request to be available tonight to provide my information and knowledge.

Question for Robert Rand 2:06:33

In your September 30, 2015 letter to Chua Xiong and in your *Professional Caution* letter to Brown County officials you stated: "*As a Member of the Institute of Noise Control Engineering (INCE), I am pledged to hold paramount the safety, health and welfare of the public. ... Based on the acoustical findings and personal experiences of motion sickness at Shirley correlated to power output, I concur with the Board determination of Health Hazard. As an INCE Member I can find no credible rationale for permitting continued community exposure to the potential for motion sickness evidenced by the research and actual neighbor reports when wind turbines are operated at partial power or higher.*" Do you reaffirm these statements at this time, and if so, what remedies exist for preventing such continuing community exposure at Shirley Wind?

Robert Rand 2:07:24

I reaffirm these statements at this time. As I explained earlier, once wind turbines are installed, if there are complaints, the only reliable noise control option is to shut the turbines down.

Question for Robert Rand 2:10:24

At Shirley Wind the day and night noise limit is 50 decibels and the setback distance from homes is 1000'. Is there a current consensus among professional acousticians regarding wind turbine noise limits and setback distances that are needed to protect the public from modern size wind turbine emissions?

Robert Rand 2:10:42

For the professional acousticians who are working to protect public health and welfare the current consensus lies in part on findings regarding the adverse health, which is related to distance, and correlation of distance from wind turbines based on their size, which is related to the power output. And we've got several sets of information which

indicate that the distances are much farther than we would have from other sorts of power generation. We have reports from the neighbors saying they need three and one half to four miles before they feel they get relief from the apparent motion sickness symptoms. And I can confirm that myself in terms of when I studied at Shirley. I had to get several miles away before I would start to feel better. In terms of the A-weighted sound level, which is a filter which greatly takes away the low frequency component, we've got numerous criteria available to us including from the WHO and from ANSI for compatibility, just to name a couple which I named earlier. And I've measured levels from two turbines, the GE 1.5s, at 33 dB(A) at a mile, and that's kind of where we start seeing problems appearing in terms of community impacts. So, direct field measurement says you've got to be at least a mile away, and that was in 2010, in January, and those turbines were not operating at full power. They were hunting. The power levels were going up and down. We can see that by the way the frequencies would change. So, we're looking at one to two miles to be in the area where we're in the mid-thirties, which is where in the Health Canada data it showed problems rising very sharply above that. So, in terms of setback distances, we're looking at one to two miles. That's where we start looking at the audible noise levels being low enough to not affect sleep. The problem with that is that those levels are averaged levels and wind turbines aren't a steady source. They produce impulsive noises which can be six to eleven dB over the average. So, if those peak levels come in through an open window, that can affect sleep, and the World Health Organization maximums associated to where sleep starts getting affected start at 32 to 35. We have two independent studies from Vermont showing that the noise reduction, outdoors to the indoors, is one to three decibels for the wind turbines that were studied out there. So we're looking at, we've got to limit the maximum sound levels, which are the peaks that come in, to under 40 dB(A) or perhaps 35 dB(A) to be sure that we are not getting effects on sleep. That puts us out much farther than one to two miles. So, we've got a serious challenge in terms of siting wind turbines when they're large. They have to be sited smaller at the beginning. The large ones are going to, are always going to present problems when they're too close to people. So, believe it or not, that's a short explanation of what a consensus could be considered to be. When we're working on behalf of public health and welfare we have to look to the WHO as a criteria set for noise impacts on health, as INCE members pledged to protect health, so we have to be informed about that. So those are the criteria that we use and we base distance evaluations based on those data.

Question for all presenters 2:15:26

Do you believe that there are those who might be more or less impacted by infrasound? While the studies in Canada talked about the entire population, wouldn't working with those with a self-diagnosed sensitivity add insight? The problem is not the people who do not have sensitivity, they would not be bothered, but do you believe there are those individuals that are more or less impacted by infrasound?

Robert Rand 2:16:08

Yes. As a person that is affected and is susceptible to motion sickness, for the time being I'm using a qualifier that people who are susceptible to motion sickness, as one who is, may be more sensitive to pressure oscillations which, as Dr. Schomer confirmed in his report, produce the same amount of force as Navy trials related to motion sickness. So, if I'm more sensitive to pressure oscillations, and there's some percentage of the population that is more sensitive, then yes, we've got a variation in the population.

Question for Robert Rand, Dr. Coussons, and Dr. McCunney 2:45:53

How much time have you spent in the Shirley Wind project, and have you spent time in the homes of the affected families?

Robert Rand 2:46:01

The time I spent in the Shirley Wind project was approximately a week, Monday to Friday, December, 2012. I was in the homes quite a bit. I stayed overnight at the Enz's home and awoke nauseous the next day, as my Table 1 outlines. We did a lot of testing at the Cappelle's home and I stayed overnight. I stayed up and stayed overnight. As a team we were kind of coming and going. My time was a little offset from the other team members because of the health impacts I was experiencing. What I wanted to do is stay during the middle of the night and see how that went. So I was there pretty much overnight at the Cappelle's home. So, it was a lot of daytime testing and I had basically two nights in two of the homes.

Question for Robert Rand 2:53:23

If sensitivity tends to increase over time, might liability also increase over time?

Robert Rand 2:53:34

Well, I think this large set of questions I have covered and I think there's no.... At least as an ordinary person it certainly appears to me that liability increases when nothing is done.

Question for Robert Rand 2:55:06

Wind proponents often make the claim that "*what you can't hear can't hurt you*" and that unless infrasound or low frequency noise can be heard it cannot hurt you. Please explain how the findings at Cape Bridgewater demonstrate that these statements are not true.

Robert Rand 2:55:21

That study in Cape Bridgewater, that was in Australia, was conducted by Stephen

Cooper, and he had a remarkable situation where the turbines went down for a period of days, and so he got turbine on operation, then nothing, and then turbine on again. And the data, there's a lot of data in that report, but to be very quick about this there are certain data that do demonstrate that people are affected even though they cannot hear the turbines.

Question for all presenters 2:57:58

In 2017 there are no complaints from local residents to Brown County and only seven complaints to the Town of Glenmore. They were about flicker, not noise. Doesn't this imply that those near Shirley Wind are not suffering?

Robert Rand 2:58:17

Well, as we already know from the previous presentations, a large percentage of the people near the wind turbines are unable to complain. They signed so called good neighbor agreements so they can't complain. I can't speak to whether people who have complained in the past continue to lodge a complaint every day when there's a problem. If people have moved away, well they're not complaining because they've taken the extreme step to obtain relief and they're not near the wind turbines. So, there could be a number of factors involved.

**Q & A Part
Questions from the Community**

Question for all presenters 3:02:15

Are there any other sources of infrasound present in the environment?

Robert Rand 3:02:23

Yes there are, but sources of barometric pressure oscillations are very rare - periodic, repeating, barometric pressure oscillations. I had a slide I presented, I forget where, but it showed, it had two graphs, one was of surf that I obtained with the micro-barometer that I use, which is a fancy low frequency microphone. And then they trace from same frequency range, same scale, from Falmouth where I got really sick and my colleague Steve Ambrose got really sick too, and the levels were the same but their distance apart was completely different. I slept like a baby next to the surf which was coming in, and every time the surf crashed there was a big delay between the surf crashes. No problem. The delay was outside the range identified by ISO 9996, and the pulsations from Falmouth were inside and we got clobbered. So, yes, infrasound relates to, is there dynamic pressure variations, let's say, slower than twenty cycles per

second. Yes, it's all over the place. The problem is, you're looking at it backwards if you ask about, is there infrasound everywhere. The question should be, are people getting sick, and that's the focus we should be on.

Question for Robert Rand 3:07:03

Many European countries have had restrictions on LFN. Have any countries lessened these restrictions, that you know of?

Robert Rand 3:07:12

What does that mean, lessened restrictions? [Moderator responds: That they allow more LFN now than they did in the past] I'm not aware of that. I'm aware that Denmark extended industrial noise limits on LFN to wind turbines over strenuous objections of Vestas back in late 2011. So, they increased the restrictions, they didn't lessen them. I don't know of anybody that lessened them, myself.

Question from moderator - Supervisor Schadewald. Repeat of question asked earlier of Dr McCunney 3:12:33

Is there any wind turbines, this big, this close to people?

Robert Rand 3:12:51

Hardscrabble, New York. It's in a lawsuit. Hardscrabble, New York, has turbines equal to or greater than this size and they're in a protracted lawsuit [Moderator asks if they are this close to people] Yes.

Question for all presenters 3:13:14

What would it take to get the link between wind turbines and a human health hazard? What do you think it would take besides what we have now? What would it take for society, America, the world, to figure out, there is or there isn't?

Robert Rand 3:13:56

I can respond in the context within which I work, which is that people can gain a visceral understanding of the issue by staying in an affected home. On that level people, individual people, can come to understand what other people have been talking about. I'm not an epidemiologist, I don't think along those lines, and I'm not a medical doctor so I don't think along those lines. The lines I think along of is direct experience, which is what I've had.

Question for all presenters 3:28:16

What can the Brown County Board of Health or the Brown County Supervisors say to people about the adverse health effects they're experiencing right now? What can we say to them based on your knowledge, your expertise, your background, you guys have tremendous amount. We're just local the politicians and chairmen looking at an issue, it's talked about, can you give us any guidance, can you give us any input, can you tell us anything that would be informative because that is really the key, OK?

Robert Rand 3:31:52

Well, my experience in power engineering is that if power-generating equipment is creating complaints they get shut down by a court order. That's my experience going back several decades. If an agency charged with authority to protect health and welfare is abandoning its authority either by delaying or not protecting health and welfare, that's a serious question because that is tearing apart the fabric of society. If we trust our health and welfare to people and agencies and they don't protect it, that's a serious matter. If noise levels are exceeding the limits required in the permit, that should automatically engage an action to, the term often used in products is repair or replace. So, that is another serious matter. If the turbines are exceeding the limit in the permit, then the permit should go under review. So, there are a number of standard processes that can be engaged within the law and should be engaged to protect public health and welfare.

Question for all presenters 3:34:45

We're frustrated because we hear people leave the area and get better. Is there any other explanation than, the wind turbine is the problem, if they leave the area and they get better. I know it's a loaded question but it's the one we face every day here. People say, they come to the Board of Health and I've heard testimony for years, I leave the area, I don't get better right away, but within a couple days, sometimes, I'm so much better. I stayed up north, I visit my relatives. I mean, do you have any, and if you don't you can pass, but do you have any explanation of what other effects?

Robert Rand 3:36:28

From our peer-reviewed paper on the Falmouth study we've got a graph that shows we arrived, then we got sick, then the turbines were essentially powered down because of the lack of wind and we felt better. The power came up and we left - we felt worse, we did some work, we left, and we felt better. So, we were repeatedly getting relief by gaining distance from the turbines. We've heard this from people, I hate to say the word but, worldwide. We've heard this same tape over and over again. As a kind of a pragmatic noise consultant I will refer to Occam's razor, which is the simplest explanation is usually the right one. The explanation here is that proximity results in affect and we have that confirmed repeatedly over and over and over by people, including the people here at Shirley.