WIND TURBINE SOUND AND HEALTH EFFECTS WEBINAR
January 20, 2010

Coordinator: Welcome and thank you for standing by. At this time all participants are in a listen only mode until the question and answer period. If you would like to ask a question at that time, please press star then 1. Today's call is being recorded. If you have any objection, you may disconnect at this time. I would now turn the meeting over to Mr. Larry Flowers. You may begin.

Larry Flowers: Thank you very much and welcome to this Webinar on a very important topic of sound and wind turbine generation; an issue that we hear often and actually more often these days as wind generation spreads across the country and closer to neighborhoods.

We have today two speakers. Lawrence Mott from Vermont and Dr. Robert McCunney from Massachusetts. Dr. McCunney has been delayed so we're going to reverse the order and have Lawrence Mott speak first about dealing with this and other kinds of issues with public officials and with the public; addressing these in a way that is a responsible approach to representing the issue accurately and effectively.

Lawrence - a long time renewable energy and wind guy. I've known him for close to 20 years. He's the principle of New Generation Partners and Chairman of Renewable Energy Vermont and Lawrence I'm going to let you lead off with about 10 to 12 minutes on this issue of addressing sound and other issues to the public and to public officials.

So Lawrence go ahead.

Lawrence Mott: Thank you Larry. Similarly I'm going to jump ahead and I will have you advance slides when I need to. Oh - no. It looks like I'm here. Perfect.

As Chairman of Renewable Energy Vermont which is a 501(c) non-profit business trade group, we have been faced with continuing to push renewable energy and especially wind power in an uphill battle in Vermont. New England, as many of you know, have some pretty interesting perspective on stopping development on ridge tops, stopping development with cape wind, a whole host of tactics. And as we know, one of the major issues used now is health effects, noise and those issues.

We set about to combat some efforts that were being launched by some anti-wind people through our legislature whereupon they were asking for guidelines and setbacks that were pretty astounding such as one mile setback from any residence.

We set about to work to combat this effort and what we found and took the strategy was to educate the people in understanding the issues and especially educate the legislators, the commissioners and various officials within our government.

Just to back up quickly, we only have a small amount of wind in Vermont. We are developing more and we are a regulated market so we have a few different controls on how we can carry forward with our permitting process. So we, as developers, are very careful about insuring that permitting changes don't occur through the legislative process.

My second slide here which was we went after the (falsehood) submits. I talked about strategy to inform the various officials and I think it's important for the various people on this call is to really sit back and think about who

needs your support. And in our case, it was our Commissioner of Health. The Department of Health was being called on by our legislature to provide a report on whether they, the Department, considered health effects an issue from wind power. And the antis had gone to the Department of Health and made presentations about acoustic diseases and other problems and cancer and such.

And we found a very receptive audience when we asked for a meeting to really use science and factual data so that they, the Department of Health, could prepare a case to present to the legislature that did prove out many of the issue that we know about and are going to be presented by Dr. McCunney.

We did have some attorneys put together a view of the regulatory market to prove that the current status of our laws did allow enough information and allowed all the review on noise on emissions and these characteristics and we compared many other rules. What I'm going to do is just touch base on a few of those slides and I've copied my slides on here for anyone to kind of use and modify and customize to your needs.

I would make a little quick advertisement. We, Renewable Energy Vermont, have now on the cusp of creating an 18 minute wind video which a good portion of it is an interview by the way with Dr. McCunney and others and property values and health and noise issues to try to attack that. We're open to a variety of ways to help you out or sell you a discount on a file that you can manufacture your own CDs. We have three developers that are going to use this to do mass mailings and send it out.

So the next slide - again, I'm not going to spend much time on this. I think the science I want Dr. McCunney to cover. But we did make this very presentation in front of three different entities in our state to help them

understand what wind power was, terminology, get their arms around. In our case, we have some old 500 kilowatt machines and they needed to understand the difference between that and a more modern 2 megawatt machine and in effect, inform them that it's not a huge difference really. From a distance, it doesn't change it and it really doesn't change necessarily these (unintelligible) or other potential health effects.

Feel free to run through those. I'm going to step through to a few high points which here is my slide on wind power was just customized as to your needs to really help communicate because, believe it or not, most people; especially in these official roles, still don't understand. We run through the principles of sound; helping them understand the decibel system. This sound pressure level slide is a poor slide. I'm sure many can do better than this.

You'll see on the right where we offered the names of the wind farms in our state Searsburg, Deerfield and gave an idea of the range. If you boil that up, it gives your test typical sound pressure level with chain saws in a room, a restaurant and a car driving.

And then we step through some of the regular data available to differentiate and understand the various DBA, DBC and again in one case, we had some real scientists in front of us who knew the questions to ask, who had been involved in permitting cases for other types of sound. Our biggest point was to say that wind turbines are no different, they don't require special treatment, that low frequency noise is not a problem, that upwind turbines do not have the issues such as older designs and downwind machines had and the low frequency patterns, especially on where you had the prevailing wind directions, meant that it wasn't an issue. And you can see our reference here - A Leventhall Study.

I would point out that - and I'd be glad to share with the group. I could send it to NREL. We put together I think four pages of references on every study we could find in Europe, around the world, and the World Health Organization references and we handed that over so that the scientists would be able to quickly do their report; make it easy for them.

Anyways, just to finish up, we did talk about vibroacoustic issues referencing Pierpont work and really clarifying what the issues were and our experience helping them understand between our older Searsburg wind farm and our more modern Lempster, New Hampshire which happens to have Gamesa 2 megawatt machines.

And we touched on the World Health Organization's guidelines. We then brought that closer to home on our regulatory system right here which is our public service board which is the entity that permits projects and how they go about. And in our case, third bullet, they did adopt the World Health's guidelines but they're more strict and they're a one hour average rather than the eight hour average and we helped clarify.

And the message in our case was our existing regulatory environment covered all the issues, that it was more strict than the World Health Organization and other issues and that the recommendation to the legislature should be to leave it alone and allow individual wind farms to go through individual permitting processing and determine the best setbacks per the project and not develop these overreaching cookie cutter guidelines.

Thank you.

Larry Flowers: Well thank you Lawrence. We still have not heard from Dr. McCunney and so what I'm going to suggest - operator, are you on the call here. Operator, are you on the call.

Coordinator: Yes, I am.

Larry Flowers: What I'd like to do while we're waiting for Dr. McCunney to log on here and as soon as he does, we will cut in on his - with his presentation. We have sent him several messages but he is a doctor and may be in an emergency.

Coordinator: Okay.

Larry Flowers: What I'd like to do is open the dialogue to comments from the audience. Like we have some 45 people on and I think looking at who they are, a lot of them have both experience and issues and questions about sound. I wanted to actually as Mark Bastasch on - he's a sound expert. And Mark, I apologize for putting you on the spot here but if you could make a few comments about your experience in measuring sound and dealing with sound with local communities.

If you would be so kind to provide some insights to the group. If not, we'll just open it up for questions and dialogue among the participants.

Coordinator: What was his name so I can open the line?

Larry Flowers: Mark Bastasch - B-A-S-T-A-S-C-H.

Coordinator: Mark, your line is open.

Mark Bastasch: Okay. Thank you. Sure. I think the points made previously were right on in that to a certain extent many states have a body that regulates noise in some form or fashion. And there has been I think some over emphasis on the differences between wind turbine noise and other sources of noise, and the Pierpont work in general kind of pointing to potential health effects that has kind of elevated the discussion or made them somewhat weary.

And I think with the work that McCunney and others have done on - so we have sound panel efforts in that we're seeing others kind of duplicate around the world helps dismiss some of those concerns in that what we really are talking about is just noise and we're not - we don't have these extremely high levels of low frequency or other noise that tend to correlate to potential diseases.

I mean we're not in that realm with wind turbines in particular.

Larry Flowers: Mark, thank you and again I apologize for putting you on the spot here. Mark is an expert in this area of wind turbine sound and sound measurements and sound impact.

I want to open it up for people's observations; either from their state or their community about this issue, as well as if anyone has addressed this issue with public officials, what their experience is as we continue to away Dr. McCunney to join us.

Coordinator: If you'd like to ask a question or make a comment, please dial star then 1. I have no questions or comments at this time.

Larry Flowers: I'm going to ask a question back to Mark so if you - operator, if you would allow Mark to come back on I'd appreciate it.

Coordinator: His line is still open.

Larry Flowers: Mark, in your experience from measurements, what has been the setbacks from turbines that you have found to - minimum setback that sort of get us away from noise issues with neighbors.

Mark Bastasch: I think that's really hard to classify, because there have been folks who are very far away claiming that they have an issue. And it's determining whether it's really perhaps a regulatory issue or a legitimate issues or if there's some other issue or aspect of the project that they were - that they are potentially sensitive about or upset about.

We tend to see that sometimes, not just in wind but in other projects, that noise perhaps is something that objectors can focus on when their real issue may be some other aspect of the project.

Larry Flowers: The noise is an opportunity to voice your concern that what your real concern is may be unrelated to that.

Lawrence, you put a graphic on here. Do you want to - I assume you want to make a comment.

Lawrence Mott: Thank you Larry. Mark's right on. I wanted to bring forth again some of the science. As I mentioned, I had three different audiences that we presented to and we had some technical people that really wanted to dig into it. And also I find in some of the more public meeting with you have the group of opposers coming out who come forth with a statement - in our state, we also will have public meetings where the public service board officials will be present and they are taking formal notes during the public meeting.

I brought this slide up because it talks about things such as the difference between higher frequencies. Another note on that third item. Lower frequencies tend to bend more towards the ground during inversions. These are all some of the scientific notion that requires a site to be evaluated individually so that in our case with mountains in Vermont and prevailing winds from the west and northwest in the Winter, we can quite easily predict where this annoyance might go and where the other houses might be in that path.

And we're required to produce that science anyways. Most projects through the permit are and there are quite a few sound experts out there that can readily predict this to show what might be an issue and what may not be. So we need to keep that at the forefront and not allow the others to come with just these blanket statements.

Larry Flowers: Mark, when you've done sound measurements on particular projects and had the opportunity to present those to communities or county officials, does the science carry the day; at least with the officials.

Mark Bastasch: It certainly seems to. I think - I generally try to encourage folks to go visit a project; particularly now that developments are more or less disbursed throughout the U.S., it's probably within a reasonable day's drive to visit an operating project. And I think that helps give the regulators or the decision makers or even the potential neighbors a sense of what we're talking about here and help put things in perspective versus just looking at, you know, a technical report and also hearing what some of the objectors may discuss.

Larry Flowers: Lawrence, I'm going to turn it back to you just for a minute or so. I'm trying to contact Dr. McCunney by phone so spend a couple minutes talking.

Lawrence Mott: No problem.

Larry Flowers: Extending your presentation. Thank you.

Lawrence Mott: What some may find humorous but I found very effective, many of us now have iPhones, and I downloaded for $1.99 one of the decibel meter iPhones. And I put it next to one of my friends $1200 sound meters and found it to be surprisingly accurate in the ranges that we're thinking about in some of these rooms around lawn mowers and power equipment and actually near some wind farms.

In all of my meetings, I put my iPhone to the decibel meter and I walked over and placed it right next to the official and while we were talking and discussing and things were going on and talking about numbers, they had the readout right in front of them on my phone. So it was a cheap and fun tool and got some very surprising reactions in response from the officials.

I really appreciated Mark highlighting the notion that the wind turbines are like other types of sound. And of course we know compared to noises that may come as a spiking sound or some intermittent sound that you cannot predict, a wind turbine is often very predictable and you can also fade into more white noise. The whoosh of the rotors are the other sound so that they do not become the annoyance.

I think, and you'll see in our presentation, we did - I'm trying to find it here. We came forward to say that it is possible that wind turbines can provide - pardon me. There it is - cause annoyance. We weren't shying away from it. The fourth bullet here - can cause annoyance and we're clear to reference some of the science on those topics.

And we did try to address Pierpont's work head on. And here you'll see I've noted...

Robert McCunney: Hello.

Lawrence Mott: Hello. Dr. McCunney.

Robert McCunney: Yes. Hello. Can you hear me?

Larry Flowers: Sure. You're fine.

Robert McCunney: Oh great. I'm sorry. Hello. Is this (Beverly). Hello.

Lawrence Mott: Dr. McCunney.

Robert McCunney: I'm sorry. It looks as if - (Beverly), it looks as though I have been able to connect. Hold on please. Can you hear me okay. I'm the speaker for 4:30. I wanted to make sure everybody could hear me.

Larry Flowers: Yes. Doctor I can hear you fine.

Robert McCunney: Okay. So we still have a few minutes to go before it begins. Correct.

Larry Flowers: No. We've been going for about a half an hour now. This is Larry, Bob. And so we have about 40 some folks on and Lawrence Mott and Mark Bastasch and I have been kicking the idea - the issue around and we are ready for you to rock and roll. Can you see the screen?

Robert McCunney: Yeah. Let me cash in here. You know, I thought it was 4:30 you wanted me to come on.

Larry Flowers: Well, whatever. We're - it's - we're all anxiously awaiting your - I'm going to introduce you. Are you - is your screen up and ready to go.

Robert McCunney: Not right. No. Not right now. Gee I - first of all, let me apologize for any difficulty.

Larry Flowers: That's okay.

Robert McCunney: Because I got the note from Susan yesterday that said it would begin at 4:30.

Larry Flowers: Okay. So bring it up on your screen. In the meantime, I will introduce you to the folks on the call. Dr. Robert McCunney. He's an internist and is board certified in occupational and environmental medicine.

I'm going to read this resume to you folks because it's really important when it comes to this medical issue to demonstrate the credentials.

Dr. McCunney has completed training in internal medicine at Northwestern University Medical School in Chicago, occupational medicine at the Harvard University School of Public Health. Dr. McCunney is a regular guest lecturer at Harvard Medical School, a member of the clinical faculty of Harvard Medical School, research scientist and biological engineering at MIT and a clinical associate in the pulmonary unit of Massachusetts general hospital in Boston.

At MIT, Dr. McCunney lectures in public health and occupational biology and conducts research in occupational lung disease. He evaluates potential occupational and environmental illnesses among patients referred to him.

Dr. McCunney is past president of the American College of Occupational and Environmental Medicine and an accomplished author. He's edited numerous occupational and environmental medicine books and over 80 published articles and book chapters.

His most recent book, A Practical Approach to Occupational and Environmental Medicine - was published in 2003.

So Dr. McCunney, as you tell, has a great background and has been retained by the American Renewable Energy Association to look at other peers and will discuss this issue of turbines, wind turbines and health. Robert, are you ready to rock.

Robert McCunney: Yeah. I hope so. Well, let me first extend an apology. I received an email. I was ready to rock at 4:30. So I'm sorry if I kept anybody waiting. In any event, thank you very much Larry for that very kind introduction. I appreciate that.

What I'd like to do today is talk a little bit about the workings of the panel that were convened by the American Wind Energy Association with the specific task being to direct whether wind turbines had any potential effects on human health. And in fact, as we can see in the current slide, the purpose of this presentation is to address the review that this expert panel conducted.

Now the panel members themselves, just to give you some background, as Larry gave you my perspective. I've been an occupational and environmental

physician for about 30 years and my primary responsibility is to address implications of work and the environment on human health and I've done that fundamentally in three major areas; by seeing patients as a physician, by teaching and also by doing research in this area.

So I thought that I'd bring to bear in this particular topic the specialty of occupational medicine. As the slide indicates, we have also had experts in audiology, acoustics, otolaryngology, which is the standard ear, nose and throat specialist, and of course, people in public health.

Now the charge to the panel was very straight forward. We were asked to review primarily the published scientific literature and to prepare a report of our findings. Now since this is somewhat new to me. I'm going to click the next slide and I want to make sure that what should happen now. Larry is the sound panel members - and then we can go forward from here. Is the sound panel members forward now?

Larry Flowers: Yeah. Yes.

Robert McCunney: As I click that. As you can see, the sound panel members include a diverse group of people. David Colby from Canada, Robert Dobie, an otolaryngologist from California, another physician on the panel, Geoff Leventhall from the U.K. who's an expert in noise vibration and acoustics, Dave Lipscomb, a Ph.D., who's also involved in acoustics, myself, Mike Seilo and Bo Sondergaard and Mark Bastasch has given us a tremendous amount of help as well. Next slide.

In today's presentation I'd like to focus primarily on what we did, what our focus was and the results of our work and then try to engage in some discussion about essentially our findings and the big picture conclusions. And

then of course as Larry has probably indicated, we do want to make opportunity available for people on this Webinar to pose questions.

With respect to wind turbines and health effects, as with any potential occupational or environmental hazard, one needs to look at what exactly is taking place. And in this case, many of you I'm sure in today's audience know a lot more about wind turbines; particularly the technical operations, than I do.

But one of the charges of the panel was to try to get some rudimentary understanding as to what is taking place so that we understood potential health risks. And primarily the concern has been raised about wind turbines is the potential effects of noise.

And noise from wind turbines can be generated in two major ways. One is just by the gear box; so called mechanical noise and the various control measures that are used to generate the turbine. And of course the aerodynamic operations of the blades also will generate noise.

Now with respect to health effects of noise, I think it's worthwhile to take a look at noise itself in terms of what it is and how it's measured and how it's defined. Now noise is really what's known as a mechanical energy and noise is primarily measured based on its intensity; that is how loud the sound is. But it's also measured by frequency. That is the so called pitch.

And the fundamental measure that's used to evaluate noise is what's called the decibel scale and many of you have heard of decibels. It's important to understand that as I describe later on in today's presentation about various decibel readings associated with various activities, I think it's important to understand that a 10 decibel difference actually indicates a tenfold increase in sound levels.

So at 50 decibels goes to 60. That's 10 times higher actually than what it is at 50.

Speech frequency is fundamentally between 500 and 4000 hertz. Some of these figures will become more pertinent to our discussion in later slides because some of the points that have been raised about potential health implications and wind turbines is sound on the lower level of the frequency; that is sound levels less than 500. Usually less than 250 and sometimes even very, very low frequency sounds have been raised as concerns.

So it's important to keep in mind that speech frequency, with you know some variations, is primarily between 500 and 4000.

Now noise is another description of sound and noise colloquially means sound that people don't want to hear; sound that some people might find disturbing for some reason or another.

Now the next slide gives you some idea of how noise levels are really measured; particularly in decibels. Now one of the - you'll see on the top the abbreviation dBA. That's the reading of decibels in the A scale. There's three different scales that are used but the most commonly used to measure, particularly in industry and environmental affairs, is to use the A scale.

So as you can see from this slide, noise levels vary considerably based on which type of tools are used, whether it's riveting, saws, grinders, furnaces and so forth, and certain industries are well known to have noise levels that can be potentially damaging; at least to human hearing.

And the reason I put this slide up is so later on as we look at some of the noise levels that are generated by wind turbines, some of these figures may add some perspective to our discussion. And frankly, this aspect of noise and health is what got me interested in this topic initially and that is to evaluate potential effects of noise on human hearing; particularly in the occupational setting. Next slide.

This is really a continuation of the noise levels in decibels and it gives you some idea of the noise levels. Jet engines of course being high. Jet take off - other activities such as rock bands are about 110. Tractors, power saws at about 100. And as you can see there's a whole range of sound levels measured in decibels associated with activities.

Speech frequency - speech range is primarily about 50 to 70 and to put some of these figures into perspective, the Occupational Safety and Health Administration in the United States requires a noise control program that is a - and a hearing protection program, if noise levels average out to about 85 decibels a day over an eight hour time weighted average. So you can see what the 85 figure may be. And again that's an eight hour time weighted average - continuous noise. And you can see where speech frequency and whisper sounds are and so forth.

As we get later in today's discussion, you'll hear that some of the World Health Organization guidelines for example call for keeping noise levels certainly less than 40 next to (unintelligible) and sometimes even lower, depending on the source.

I'll give you some idea about frequencies and hearing. As I mentioned, speech frequency is primarily 500 to 20000 hertz. That's the real extreme range whereas most of the time it's about 500 to 4000 hertz. Low frequency is, you

know, some of these definitions are arbitrary in the sense that they're by conventional wisdom, but low frequency is primarily 250 hertz and lower.

Now you can see here that clearly 250 is less than 500, and 250 is less than most speech frequency ranges - which gets to the heart of the matter that some of the concerns that have been raised about wind turbines, and that is, is it possible that sound may be generated by wind turbines that most people don't hear that could be damaging human health? And that's been one of the questions that the panel tried to ask.

So let's take at look at E sounds and infrasound is defined as less than 20 hertz in context of wind turbines. There are three kinds of sounds that are emitted by wind turbines. There's the so called infrasound which is defined above as less than 20 hertz. There's the low frequency sound and this really will vary anywhere from 10 to 200 - 10 to 250. As I said, the definitions are arbitrary but fundamentally in this range.

And then another notable sound that's been associated with wind turbine operations is this so called fluctuating aerodynamic swishing sound that many of you are familiar with. And I think it's important to point out that this swishing aerodynamic sound is really in a frequency of about 500 to 1000. And as you can see, that range is considerably higher. It's certainly audible; meaning people can hear it. It's certainly higher than the low frequency and infrasound that has been raised above. Next sound. Next slide.

One of the concerns raised by people who have been concerned about whether sound from wind turbines effect human health in some way or another is the so called infrasound. And I think it's important to look at this slide from a couple of perspectives. As the first column indicates, that's the frequency

measured in hertz. And going from left to right, you start with 4 hertz, 8 hertz, 10, 16 and 20.

Now most people can't hear at this level. There are variations among people of course and there are going to be exceptions to every rule so some people might be able to listen to less than 20 but fundamentally, these frequencies are in a range where most people don't hear it. That's point one.

Point two is it's important to note the lower row there where you can see the noise level in decibels or sound pressure level that is needed to be generated in order for frequencies at this level to be heard. This slide indicates for example that at four frequencies - 4 hertz, the sound level needs to be the 107 decibels to be heard. Now recall some of the earlier slides we looked at where like power saws and jet take off and so forth were upwards of around 110, 130 decibels.

The point of this slide is as the frequency level lowers the sound level that needs to be generated for that frequency to be heard, gets higher and higher. Even at 20 hertz, as you can see all the way to the right, you need to generate a noise level of about 80 decibels. That's considerably higher than normal speech frequency.

In fact, the rule of thumb that we use in occupational medicine when you go to a factory to determine whether the noise levels may be high for human hearing, is that if you have to raise your voice at arm's length to someone you're talking with, that usually indicates that the noise levels are in the 85 plus or minus 3 or 4 decibel range. So the point of this slide again is as the frequency gets lower, that is 4 to 20, the sound levels have to be pretty high in order to be recognized. Next sound.

Again, the noise levels refer to the loudness of the sound necessary for it to be heard at the respective frequency. Many of you listening today may have sat through a hearing test and for those of you who don't, what often happens in a hearing test is people are placed in a soundproof booth and then a technician outside of the booth applies various frequencies, low and high, and raises the volume of those frequencies until the person can recognize the sound.

So the point is that every sound has a certain frequency and there's a certain loudness or decibel level associated with that frequency in order to be heard.

Now wind turbines in general may liberate or generate infrasound from wind turbines but it's usually at a level of 50 to 70 decibels - sometimes higher, but usually well below the audible level at the frequencies that I described.

Now remember from the previous slide that I pointed out that once the frequency is less than 20, you need approximately 80 or higher decibels for that frequency to be heard, which of course is one of the concerns that's been raised by people who have questioned whether there are health effects associated with wind turbines - and that is some folks have raised a point that even though you can't hear it, that is you can't hear the frequency, maybe it could be harmful.

It's important to point out for discussion purposes infrasound because our panel tried to look at it, as I mentioned in an earlier sound, infrasound, low frequency sound and sound levels in general as to whether they can effect human health. So I thought I'd be important to at least make sure we're all agreeing on the same terms.

Now infrasound is usually due to frequencies of very long wave lengths which can travel long distances and can actually pass through walls and windows with little attenuation or reduction in it.

Many of you who may have stood in an area where there's a rock band, next to a bass guitar or a speaker where the bass is high, realize that low frequency sound can cause vibrations. And that's one of the concerns that have been raised by people who have raised issue about wind turbines and health effects; that is see these low frequency sounds. They make it transmit it through walls. They make it transmit it through long distances. And when they do reach people, could those low frequency sounds adversely affect health.

Well, from the point of view of the panel at least and we'll get into more detail later, there's really no evidence as far as we were able to find, for any physiological effect, certainly adverse effects, from infrasound or low frequency sound at the levels generated by wind turbines.

There can however be effects from sounds if they're audible. Remember that slide I showed where the top level was 4 to 20 hertz and the bottom level showed you the decibel levels needed to be heard. Now clearly if people are standing in areas where there's noise levels, 100, 110 decibels, those sound levels without a doubt can be damaging to human health; human hearing primarily.

And another concern raised about the operation of wind turbines is the vibration that may occur along with the low frequency sound. And in fact the vibration is inaudible low frequency noise has been postulated by people who have raised concerns about wind turbines as having a potential adverse effect on health. So part of the panel's responsibility was to look at vibration, at least

in terms of some of the literature at these levels, to determine whether it adversely affects health.

Unless sound, vibration refers to the way in which energy travels through solid material and vibration can travel through all sorts of solid material; whether it's steel, concrete in the bridge, the earth, the wall of a house or in fact, even the human body.

And it is the vestibular system, that is the part of the body that's associated with balance that has been put forth as potentially effected by vibration associated with low frequency sounds from wind turbines. Now for that in mind, I think it's important just to give a background as to what the vestibular system is so that you understand some of the points that have been raised.

These vestibular organs are specialized for stimulation by head position and movement; not usually airborne sound. So it's where we position our heads so we know where we are. So for example, this part of the body helps you when you put your head into a sink to wash your face for example that you don't fall into it. It's a way of telling you when your eyes are closed where the position is. And each vestibular organ is firmly attached to the skull to enable it to respond to head motion. So it's helping to give us a perspective in the environment.

Now it's important to point out that this may sound too technical, but the hair cells in the cochlea that's part of the inner ear associated with hearing, these are not directly attached to the skull and they do not normally respond to head movements but the movements of inner ear fluid. This may seem awfully esoteric but it's important in evaluating the literature.

Let's take another look at noise in terms of noise levels and what it may mean because as you pay more attention to wind turbines and health effects, oftentimes concern will be raised about noise and what the noise levels are.

There's no doubt, as I mentioned earlier, that once noise levels get to about 80 to 85 decibels, it will interfere with normal conversation. And as I mentioned earlier, if one has to raise his or her voice at arm's length in speaking to someone, oftentimes that means that the noise levels at least 80 decibels.

Now why that's important is part of what the panel looked at is noise induced hearing loss because there's absolutely no dispute that chronic long-term exposure to noise or even acute short-term exposure to noise can adversely affect hearing. That' irrefutable. And it's important to point out the levels of noise and for what period of time those exposures have occurred, excuse me, are in fact associated with noise impairment.

And as you can see, you pretty much have to be exposed to noise levels greater than at 80 decibels on average, eight hours a days, five days a week for many years in order to have noise induced hearing loss from noise exposure. Now obviously with human health, there's considerable individual variability in how people respond to any exposure. So these are general guidelines.

Task interferences refers to - it could be anything. It could be writing up a report. It could be being on the telephone and so forth but by and large, levels of noise less than 70, with rare exceptions, are not usually adverse to health or even to task annoyance. The problem is there's some concerns about annoyance with respect to noise.

In fact, some of the studies that I'll describe shortly relate that some people are "annoyed" by noise levels generated by wind turbines. And it's important

to point out that annoyance is a factor that's very hard to define. Annoyance is a factor that has a tremendous amount of individual variability in terms of what levels cause certain people to respond in terms of being annoyed and attitudes about wind turbines themselves, as you will soon see in some of the studies we've looked at, have a lot to do with whether people are annoyed by wind turbines.

In short, if people think the wind turbines are a good idea, they're less likely to be annoyed by the noise. If people are hesitant about the wind turbines for whatever reason they may have, they're more likely to be annoyed; believe it or not at the same noise levels.

Again, this is more of the same and I'm being redundant at this point but just so you know, speaker's voices customarily in a conference room would be anywhere from 50 to 70. Clearly, as you raise your voice, the levels get higher and you shout they get even higher.

Now what did we find? What I tried to do earlier here and I hope I haven't put too many people to sleep, is to give you the framework in which we were operating. We tried to fundamentally focus on noise and the components of noise such as low frequency and infrasound and then we tried to focus on vibration. We also looked at studies that quite frankly have evaluated potential health effects in wind turbines.

And the way you do that, at least the way we started, was by looking at a database maintained by the National Library of Medicine in the United States called Pub Med where peer reviewed literature, that is articles that are published in medical journals and scientific journals, and have gone through the peer review process which essentially means that an author or authors submit a paper and it's reviewed by two or three colleagues. There's

discussion back and forth about areas for clarification or improvement or errors or whatever it might be, with the overall purpose being to improve the quality of the work, it then becomes submitted to the journal and published and ultimately publicly available.

So what we found in this type of search, the first search on wind turbines, where there were three what are known as cross-sectional studies of people living in vicinity of wind turbines. By cross-sectional I mean just as the term implies. If you had a pipe and you cut a hole right through the pipe, through the whole diameter, that's called cross-sectional. That means at one particular point in time you're evaluating what the exposure may be; that is the wind turbines and you're evaluating people's response.

And customarily these responses have been in the form of questionnaires. So what we found is that these studies that have been done were primarily in Europe; usually in the Netherlands and Sweden and the major concern raised in all three of these studies was annoyance. And as I mentioned earlier, annoyance was related to personal factors and attitudes towards wind turbines and some of the studies did indicate that as the noise levels increased, that more and more people were likely to be "annoyed."

And I realized that using the term annoyed may be perplexing to those of you who are hearing it but essentially that's how the questionnaire was addressed. Are you annoyed by the wind turbine? Are you annoyed at certain levels? What causes you to be annoyed? Are you annoyed at night? Are you annoyed during the day? Are you very annoyed? Partially annoyed and so forth. And as you can see that once you get to the noise levels of about 35 to 40 decibels, about 5% of people surveyed reported annoyance.

Now before I get into more detail, it's important to note that unfortunately none of these studies had a control group. Now a control group would be you'd have similar people who are otherwise the same you know in age and gender and so forth and fundamental health concern, except they would not be living in areas of wind turbines.

So these studies were done where people who lived in the proximity of wind turbines were given questionnaires and then various aspects of the wind turbines were addressed. And a number of them - the power generated by the wind turbines and so forth, but the point is that as you can see, as the noise levels do go higher, from 35 to 45, more people were annoyed and report annoyance. And these results were pretty similar whether the studies were done in the Netherlands or in Sweden.

Now annoyance - clearly there are many environmental causes of annoyance. I don't want to be cute about this but people can become annoyed for all sorts of reasons whether they're stuck in traffic or standing too long at the post office or being frustrated with a person who's keeping them late. I don't mean to minimize the important of annoyance but annoyance is a very general term for which there are many explanations obviously.

And as I mentioned earlier, as the noise sensitivity of people, and there are variabilities in people's noise sensitivity. As I mentioned earlier, some people might be able to hear low frequency and infra frequency sounds whereas others may not. And it's the same approach when it comes to individual variability about annoyance and noise sensitivity.

What the Swedish study showed is about - just about 8% - about 7 to 8% of people that surveyed felt that they were either fairly or very annoyed by wind turbines as the level of noise increased. And as I said, the personal

characteristics effected the development, or the reporting at least, of annoyance.

By that I mean these studies actually looked at people's so called attitudes towards wind turbines and as I mentioned earlier, people who did not like or didn't feel comfortable with the wind turbines for whatever reason, tended to be more likely to report annoyance from the wind turbines in contrast to people about whom the wind turbines didn't bother them or they thought it was helpful.

Now with respect to low frequency noise - as I said, we looked at three key areas. We looked at wind turbines studies that looked at people's reactions to them. Then, after there are only these three studies we found of people in the proximity of wind turbines, we then took a look at the agents as it were - the exposure agents that were associated with wind turbine operations to see if studies have addressed those factors.

For example, then we looked at low frequency noise and health effects. But we really weren't able to find any link between low frequency noise from wind turbines and health effects. There was just nothing in the scientific literature to support a link. And for comparison purposes, we thought it was important to point out that the FDA, which is the Food and Drug Administration in the United States, actually approved infrasound for therapeutic massage at 70 decibels.

And recall as I mentioned earlier that most of the time the sound levels that have been reported where people were annoyed, were in the levels of 35 to 45. So you can see that the FDA has approved the use of it for sound at 70 decibels as not harmful to human health. And for any of you who have had experience going through the review process for new pharmaceuticals or new

therapeutic techniques or devices, realize the rigor that the FDA exerts in giving approval to some of these methods.

So I think this type of approval, in light of the absence of findings of problems, I would hope would provide some assurance about low frequency noise and absence of serious health risk.

We did talk a little bit about flicker in epilepsy but it was not part of the report so we left it in there for some discussion. That is a complicated topic. As far as we're aware, there really were no bona fide reports of epilepsy among people who have what is known as photo sensitive epilepsy secondary to wind turbines.

So in conclusion here, what we wanted to discuss was that noise and health certainly from wind turbines has no risk of hearing loss. People are not going to have their hearing damaged by living in the proximity of wind turbines. The noise is simply not high enough to damage human hearing. There's also no risk from infrasound which is a component of the sound that may be generated by wind turbines. And as we said, this so called annoyance is affected by personal factors and noise sensitivity at low frequencies.

One of the panelist members had a lot of experience in low frequency noise and was quick to point out that there may be as much as a 12 decibel variability in people's ability to detect low frequency sounds and infrasound.

We also looked at the so called vibroacoustic disease. Vibroacoustic disease refers to vibration that may affect the acoustic system. And we looked at two reports. There were two what are called case reports of two families and just so you understand the perspective of scientific studies, there are a lot of different types of scientific studies where information is gleaned about

potential health risks. And I think it's important to point out that each type of study has it's certain advantages and disadvantages but more importantly, each type of study should be interpreted with greater or lesser impact primarily in terms of cause and effect.

Now a case series or a case report is where - and I think case reports and case series have certain value in certain settings. I've certainly published case series and case reports. But what they do is they're really hypothesis generating activities.

In plain, straight forward English, it means these case series are designed for a physician or an investigator to write up his or her experience saying that gee, exposure to this chemical seems to be associated with this type of kidney disease. We haven't seen it before. We're writing it in the literature to see if anybody else has seen it and to see whether or not more detailed, more sophisticated studies might be done to evaluate whether there's a link between this potential cause of the chemical and this particular disease.

And the same approach should be applied to case series and wind turbines and health effects. And that is case reports. These are two families where investigators wrote up their experience with certain people who seemed to have adverse effects from noise levels associated with wind turbines. The exposure that was written up was mostly 55 to 60 decibels and as we've talked about, this is really speech frequency range. It's nothing really extraordinary. It's considerably lower than any levels that have ever been associated with noise induced hearing loss.

And like most case reports, again not to find fault but to put it into perspective, there's really no control group. It's not as though for example these two families were compared to two other families who were pretty much

the same in terms of age and gender, personal risk factors, that had no exposure to wind turbines. That would be a minor control group.

There's also lack of control for confounders. What a confounder is - let's say you're trying to determine whether somebody exposed to this chemical I described and seems to develop a kidney disease, you'd have to look at other causes of kidney disease.

For example, high blood pressure can cause kidney disease. Diabetes can cause kidney disease. There are all other explanations and these are called confounders. These factors have to be considered in determining whether exposure to any environmental hazard and any health effect can really be considered causal. And generally speaking in case series, there's really no control for confounders.

The other point that we want to bring to people's attention is that there's also low frequency noise in the body. Heart sounds for example are at the decibel level of about 20 to 40. Even breath sounds get in the area of about 200 to 400. So normally there's low frequency noise generated by our human physiology. As I said, the heart's there - about 25 to 35 and lung sounds as you can see. Clearly there's variability.

Now another point that's been brought up by some folks - in fact there's a book that just came out by a physician by the name of Nina Pierpont who has advanced the concept known as so called wind turbine syndrome.

And from the panel's understanding and certainly my perspective as well, this syndrome as it were and I'll describe that momentarily, which essentially is a collection of symptoms, that's all a syndrome is, appears based on two hypotheses or two scientific ideas; and that is one, that the low levels of

airborne infrasound from wind turbines at very, very low frequencies, directly affect the vestibular system.

And recall that I mentioned earlier that as you get lower and lower in the frequency, the sound levels that are necessary to be - to have that frequency recognized by a person are extraordinarily high.

The second hypothesis that's been proposed is that low levels of airborne infrasound from wind turbines at 4 to 8 hertz enter the lungs via the mouth and then vibrate the diaphragm and that is transmitted into the viscera. The viscera is a fancy name for internal organs like the stomach and the intestines and so forth.

And the wind turbine syndrome from our perspective, that is the panel, that these sounds from outside the body do not cause a high enough excitation within the body to exceed internal body sounds and cause any problem.

We also found that this wind turbine syndrome seemed to be very similar to a concept that's been advanced earlier known as noise annoyance. And that is that the wind - we felt that the wind turbine syndrome really wasn't any new diagnosis or new finding but was really an example of what's been described earlier in the literature and that is stress effects of exposure to noise - virtually any type of noise.

And this is a finding that's been displayed by a small proportion of the population for many years; even back into studies in the early 1970s. So my point and the panel's point is that so called wind turbine syndrome is really a reflection of what's been known for many years and that is annoyance at certain noise levels.

It's important to point out that wind turbine syndrome as advanced is not a recognized diagnosis in the medical community and there's really no unique symptoms or combination thereof that would lead to what anybody would call a specific disease. And as I said, to amplify an important point, is that these symptoms in some people really seem to be the same that's been associated with annoyance to low levels of noise.

Now there's another disease and I know when you see all these diseases written out, it seems worse than having end stage cancer but when you look at a term visceral vibratory vestibular disturbance. If you take each word apart, you can see what the - some people have advanced as a potential adverse effect of wind turbines. Visceral as I said refers to the viscera. That is the internal organs of the body. You know, the liver, the intestines, the stomach and so forth.

And vibratory of course refers to vibration. And vestibular refers to the balance system we talked about before. So the concept being that as the frequency goes down low, that there is higher generation of vibration that affects both the viscera and affects the vestibular system. And what's been proposed is that the wind turbine sounds and the 4 to 8 hertz spectral region causes vibration in these abdominal viscera and that in turn these vibrations send neural, that's nerve like signals, to the part of the brain that receives information from the vestibular labyrinth. In plain English, the balance system.

So the theory being that these vibrations adverse the internal - adversely affect the internal organs to ultimately cause people to feel dizzy and have balance problems.

Now in more detail -- and this may be more detail than any of you wanted to hear -- but just for perspective purposes to understand what's been advanced by people who have raised concerns about health implications of wind turbines, these visceral receptors that have been proposed as a mechanism, that is how this so called disorder happens, respond to static gravitational position and not the vibration. Remember I said earlier if you put your face in the sink and you close your eyes to do it, the visceral system is going to be telling you how far to go without banging your head in the sink.

The point is that this mechanism is proposed - that has been proposed by some people is not really valid and if the vibration sensitive receptors were in fact in the viscera, they would be constantly barraged by low frequency sound such as blood flow, bowel sounds and heart sounds and so forth. And fundamentally, these external sounds would be attenuated, that is reduced by overlying tissues.

This is very, very important finding. For example, earlier in my career I was asked about whether women who were bearing children, you know, that is in various stages of pregnancy would have the hearing of their fetus damaged if they happened to live in areas that are very noisy; whether it was construction work, aviation like airports and so forth, and highways. Could that adversely affect the fetus; particularly you certainly wouldn't want a child being born with any adverse effects on hearing.

What the studies have shown though is the uterus itself, particularly during pregnancy, can attenuate external noise by as much as 30 decibels. So the point is that these external sounds can be attenuated by the overlying tissues; one such example of course being the uterus.

And finally these wind turbine sounds at realistic distances possess little if any acoustic energy above ambient noise levels as I've mentioned many times during today's presentation.

Now interpreting studies, I think it's very important to have at least a rough understanding of the different types of studies that are done in science and environmental health, occupational medicine, cancer research and whatever to determine the, you know, how much credence or how much validity or how much concern should be directed to studies that have linked exposure to hazard to a potential adverse health effect.

There are a number of major study types. One is this implication report were a doctor sees something says gee, my patient worked with this chemical. He never worked with it before and now he has kidney disease.

And he doesn't have high blood pressure or family history or diabetes. So I think this chemical had something to do with it.

That's great. Write it up, get it into the journal. Maybe people in other areas said gee, I saw the same finding. Okay, other case reports are written so that there's more concern directed.

These studies really generate ideas but they really can't be used for causal determination.

And I think it's important to point out that the Dr. Pierpont study, her report is a case series essentially of 23 families. The other investigator's in Portugal who have raised concerns about (viveral) - I mean visceral vibratory disease. They're case studies as well.

So as you go up in sort of the scientific pyramid as it were, then you get into the cross sectional studies as we talked about before, the wind turbine studies in the Netherlands and Sweden.

And then you get up even further in what are called the longitudinal studies where we say gee, we'll put a wind turbine in here and we're going to evaluate people from this point onward.

And we'll evaluate people who have nothing to do with wind turbines. And we'll have a control group and we'll follow them over time and we'll look at the exposure levels inside the house and outside the house and so forth.

And you can see that as you go higher, higher up in these types of studies the amount of attention or the credibility given the studies really improves.

Now it's very, very, very important to make sure you have a control group. Because let's say for example we're - we are, excuse me, we are developing a new scientific chemical or we're developing a new product and we want to make sure that it doesn't affect people.

So we do a study and we find out that gee, 10% of people who use this substance get headaches. Well it's important to know how many people in any particular day of the week get headaches.

So we know okay well, 10% of people use this substance get headaches. But then we have a control group that's pretty similar. And 9% of them get headaches anyway. So it's - and then you do statistical analyses and so forth.

The point is, you really need control groups, that is people unexposed to the hazard to try to make sense out of what the exposure may be causing people.

It’s very important to avoid biases. For example in the Dr. Pierpont studies that she’s done, the people who participated in the study were those who thought they had a problem from wind turbines.

Now the ideal set of study would be to recruit people who really have no pre-formed ideas about whether the wind turbine affects them or not. So there’s no bias. You’re not actually seeking people who really feel they have a problem. Because when you do that, the results gets skewed and distorted.

Next is interpreting the scientific literature. As I said in the case of wind turbine noise and its relationships to wind turbine syndrome and vibroacoustic disease, we really only have the weakest type of evidence.

These are case series from one single investigator with respect to wind turbine syndrome and one investigator with respect to vibroacoustic disease.

So again, this is very limited information. And these reports can suggest hypotheses for further research but they certainly do not demonstrate any causal connection.

One of the other areas that we have been - to switch topics here that we've been asked to address -- and I am wrapping up -- I have a couple of slides left -- is how to provide guidelines for siting wind turbines.

And like other sources of noise, really a uniform regulatory approach for wind turbine noise has been - not been established either domestically or internationally.

So we suggested approaches that have been used for other environmental sources of noise, whatever that source may be, be applied in similar situations with the direct message being in our view there's nothing unique about the noise that may be generated from wind turbines that would require a special approach.

There are World Health Organization guidelines. And these according to our panel represent a consensus review of international expert opinion on the lowest noise levels below which the occurrence rates of particular effects can be assumed to be negligible.

Sounds like a mouthful of information. But what these guidelines try to do is give a specific number that is likely to be protective.

Moreover it's important to keep in mind that even if these World Health Organization guideline values are exceeded, it doesn't necessarily mean there's an adverse effect from the noise.

Nonetheless the guidelines form a starting point. And cost of benefits of reducing noise levels need to be addressed.

So in conclusion -- and we were right on time here -- I was asked to a 40 minute presentation -- the - let me summarize the conclusions and then we can have some time for discussion.

That noise from the wind turbines does not pose a risk of hearing loss or any adverse health affect from our perspective.

Now there’s no question that some people may become annoyed from the sound of wind turbines, but there’s a fair amount of debate about whether annoyance is really a health effect.

Clearly annoyance if it’s chronic and severe can lead to stress and potentially other issues. But there’s such individual variability in the discussion of annoyance that the panel concluded that annoyance per se wasn't really a disease.

Third, the major cause of concern from wind turbine noise is the fluctuating nature, that swish sounding.

And remember I pointed out that that swish sounding is in the frequency of about 500 to 1000 hertz -- not at the low frequency level.

And, you know, of course some people may find this noise annoying. And that reaction may depend on their personal characteristics more importantly than the intensity of the noise itself.

Fourth point is that the sub audible low-frequency noise and infrasound from wind turbines really in our view do not present a risk to health and that this wind turbine syndrome that’s been advanced by some folks is in our view neither a new disease or an accepted medical diagnosis. And the symptoms were more importantly really a reflection of noise annoyance itself.

So with that in mind, I want to thank everybody, particularly those of you who stayed awake and invite questions or any commentary on any point that I've gone over. And I'll certainly do my best to try to answer you. Thank you very much.

Larry Flowers: Thank you Dr. McCunney. This is Larry. And operator, can you open the lines for questions now?

Coordinator: Thank you sir. We'll now begin the question and answer session. If you would like to ask a question please press star 1.

Please unmute your phone and record your name clearly when prompted. Your name is required to introduce your question.

To withdraw your request it's star 2. It'll be just one moment for the first question.

It looks like our first question will come from (John Baker).

(John Baker): Yes (John Baker) here with Gamesa Energy. And I was just wondering if - I know the presentation didn't touch on the accuracy of modeling sound inputs when presenting information to municipalities for consideration of sound (bubbles).

So essentially before you built the wind farm if you used a WindPro model to say they'll be at this level and whether or not those effects have been borne out after construction of the wind farm?

Larry Flowers: You know, (John) this is Larry Flowers. Mark Bastasch, that's one of his sort of professional roles. Mark, do you want to respond to that question?

Mark, are you still on?

Robert McCunney: I don't hear Mark unfortunately.

Mark Bastasch: Hello?

Larry Flowers: Yes Mark, did you hear that question?

Mark Bastasch: I did. I did. And I think there can be some variability there. I'm not - I have not seen growth succeedences of modeling results. It all depends on the quality of the data that was used to model and the level of assumptions.

I think there obviously can be some variability. And that's true of any model, when we look at highway noise modeling or FAA noise modeling. And those are using federal models that there is a little bit of variability associated with that.

But again, I think the folks that I've worked with and others, I'm not aware of very significant deviations there.

Larry Flowers: Next question please.

Coordinator: (Ed Bloom)?

(Ed Bloom): I managed to stay awake and I'm an old guy who has trouble staying awake. But I - so I thought it was very interesting.

One of the other studies that's floating around that the anti-wind folks like to site is the study conducted by the Minnesota Department of Health.

Do you have any thoughts on that how - and whether it's credible or not at all?

Robert McCunney: Frankly I can recall one of the areas that I forgot to mention during our discussion is that our initial focus of the panel was to review what are known as scientific peer-review literature.

(Ed Bloom): Okay.

Robert McCunney: And that is if you go to the National Library of Medicine Pub Med...

(Ed Bloom): Right, okay.

Robert McCunney: ...of peer-reviewed literature, we tried to address the non-peer-reviewed literature as much as we could.

The problem is that there's no way of knowing that you get everything that's out there that is in the non-peer-reviewed literature.

And I - to be honest, I can't recall what that study showed. But if you can summarize the results I can give you an impression or perhaps Mark or Larry may be more familiar with that study.

(Ed Bloom): Well I think the anti-wind folks cite it as concluding that there are health effects. And, you know, they were not - I don't know what they reviewed. Supposedly they did the same thing you did and came to a different conclusion supposedly.

Robert McCunney: But no new data that it was a review of existing studies in their own...

(Ed Bloom): Yes.

Robert McCunney: Yes. As I mentioned, the major issue as I see it at least in the panel was that is annoyance a health effect?

(Ed Bloom): Right.

Robert McCunney: I mean there's no question that studies have suggested that people have reported being annoyed and secondary to some noise levels associated with wind turbines.

And the problem is annoyance is very, very difficult to objectify, you know, unlike high blood pressure where you can do a measurement or you can measure your white cell count or measure the noise level or you can measure your hearing ability.

How does one really measure and annoyance or define it? And the measures that have been used at least in the studies I've looked at have varied in terms of how the questionnaires have been posed.

I mean they're - so I - that's where I think the tricky area is. In fact some of the criticism to our paper has been that we concluded that customary annoyance is not a health effect and there are people who disagree with that conclusion.

Larry Flowers: Yes, this is Larry. I think the concern in places where there's not a lot of wind developed is noise is one thing, health is something that is really fearful.

And that's one of those issues that if you put that to a community that this might cause health effects as opposed there will be some noise associated with this, one is a much bigger impact than the other.

Robert McCunney: And to amplify what Larry said, at least from what I read and when I see some of the articles about implications of wind turbines, it's almost posed as though the sound that's generated, you can't hear it, you can't feel it but it damages your health.

And that's a very difficult proposition to refute other than what we tried to do by looking at the literature and showing that one, that these low frequencies although they may be generated aren't really loud enough for the peaceful to hear, and secondly, that the frequencies that are generated are very typical even of how the body operates itself in terms of the heart, the intestinal sounds, lung sounds and so forth.

(Ed Bloom): And I don't - am I still live here?

Larry Flowers: You are.

(Ed Bloom): Okay. And I think with respect to the Minnesota Department of Health report, I think it's important to realize they really - they presented a summary of some of the claims.

And their conclusions, I'm not sure that I would agree with the characterization that they concluded that there was a significant issue here.

Robert McCunney: Oh, okay.

(Ed Bloom): So I mean they did summarize some of what Pierpont and others, you know, were stating. And I'm - my interpretation of what that document says and concludes was not that there is a significant health effect there.

Larry Flowers: Next question?

Coordinator: Our next question comes from (Eric Lantz).

(Eric Lantz): Okay this is (Eric Lantz). And this was actually going to be an earlier question but I think I'll use the opportunity to ask about the annoyance factor again.

I think I understood you saying that there's a small portion of the population that is particularly sensitive to noise and might become annoyed more readily?

Does that - did I hear that correctly? And does that correlate at all with the frequency of high levels of annoyance from the European studies?

Robert McCunney: Those were a good question. The noise sensitivity when we use that term (Eric). was to describe the - that 12 decibel variability in a person's capability of sensing low-frequency noise.

For example, as I indicated, hardly anybody can detect noise less than 20 hertz. But some people do.

And like by the 12 decibel noise sensitivity was indicating that gee, some people may go down to say 16 and other people may only go down to 28. So there's no question that there is a variability in how people perceive noise.

The question you asked though is an excellent one. And I don't think it's been addressed in the literature that is whether there's any link in terms of noise sensitivity as an objective measure and the reportance of annoyance? Interesting question to ask.

I don't remember seeing that specifically post.

(Eric Lantz): All right, well thanks.

Robert McCunney: Yes, so I can't answer your question. But I don't - I just don't know. But I would sense that it probably would be frankly.

(Eric Lantz): Sure. It seems like a likely case and I guess maybe an area for future study.

Robert McCunney: Sure, absolutely.

Larry Flowers: Another question?

Coordinator: Again, if they would like to ask a question it is star 1 and record your name.

Robert McCunney: I guess the one point that if, you know, if I were caught up in some of these, if I can offer a comment while somebody's waiting to pose a question, I really think some of the key areas here is how to understand the literature.

I know Dr. Pierpont has raised a lot of concern in citing of wind turbines and their operation and so forth.

And, you know, I don't mean to be disrespectful because there's obviously a lot of hard work that she put into her effort. But the work has to be put into context. And it's a case series.

And in my field of occupational and environmental medicine for the past 30 years, I am frequently asked whether exposure to some agent whether it's asbestos, coal, silica, beryllium, PCBs -- you name the solvent -- has caused some health effect whether it's lung disease, liver disease, kidney disease and so forth.

And sometimes you're posed with new questions you haven't heard before. And when I go through the literature, you know, case series and case reports are very interesting.

As I said, if you look at my CV, I publish them myself. But the case series are never, ever, and I say that pretty emphatically, used to draw causal connections that is A caused B. They're not used for causal connections. They just don't have the scientific validity.

So what that means is that, you know, Dr. Pierpont in her work without even going into it it's, it has to be called what it is which is case series without a control group where there's overwhelming selection bias.

By that I mean people self-selected to participate who thought they already had a problem from the wind turbines.

And again, the work has value in that limited context. But I don't know anyone anywhere that would use case series to draw causal connections between exposure to any hazard and any health effect.

And that - I just hope that my comments aren't at all disrespectful. I mean it's really just to put that work into the proper context of drawing causal inferences.

Larry Flowers: And one of - this is Larry Flowers. And one of the real challenges to the network, the (Wind Talk) America and AWEA network and the advocacy network is to take this complicated and highly technical topic and accurately and responsibly represent this in public meetings.

I mean it would be great if we could clone Dr. McCunney and every one of us have him at our side in all the public meetings we go to.

But we're going to have to come up with a way to communicate this effectively and responsibly, not emotionally on a very emotional topic and a topic that is raising its head a lot of places.

And whenever you have something that deals with health, I mean I was involved in the utility industry 25 years ago and the EMF concern and cancer.

You start talking about the, about issues that affect people's health and it is right there as the number one issue. And it's easy to say no in those cases.

Public officials are not medical folks. They don't have the time to look into the literature in a responsible way.

And so one of our real challenges is going to be able to do this in an effective manner. I'm sure we can have additional Webinars for county officials and so forth but on a project by project basis. This is going to be a real challenge.

One of the analogies that comes to mind is the climate project and taking climate science which again is a very complicated somewhat uncertain science, and communicate it in an effective way so that people are - not comforted in that case, but are made aware of what the scientific community is saying and what the risks are so they can act accordingly.

So that's going to be one of the (Wind Talk) America AWEA challenges is to take this good work that this panel's done and put it in a format in a way that's both responsible and effective.

With that we've been on for about an hour and a half. I want to thank you Dr. McCunney, sorry for the miscommunication. Thank you Mark Bastasch and Lawrence for our dance that we did for the first half-hour.

And thank you for all the folks that are on the line. And keep tuned because I'm sure there's going to be additional discussion and presentation information.

So thank you for an excellent presentation Dr. McCunney. We appreciate all the hard work you've done and the credibility that you've brought to this important topic.

And with that I want to say bid adieu. And will be in communication with the network on this important topic. Thank you very much.

Robert McCunney: Thank you very much. It was a pleasure to be of help. Bye now.

Larry Flowers: Bye.

Coordinator: Thank you. This will conclude today's call. You may go ahead and disconnect.

END