In The Matter Of:

LIVINGSTON COUNTY ZONING BOARD OF APPEALS

November 18, 2014

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LIVINGSTON COUNTY ZONING BOARD OF APPEALS
CASE SU-7-14
PLEASANT RIDGE WIND ENERGY PROJECT

November 18, 2014
6:00 PM
Pontiac Township High School
Pontiac, Illinois

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(Commencing at 6:00 p.m.)

CHAIRMAN CORNALE: Chuck, roll call please.

MR. SCHOPP: Okay. This is the November 18, 2014, continuation hearing of Livingston County Zoning Board of Appeals review of Livingston County Zoning Case SU-7-414, Pleasant Ridge Energy, LLC/ Pleasant Ridge Wind Energy Project starting at 6:00 p.m. here at the Pontiac Township High School at 1100 Indiana Avenue in Pontiac. Roll is Mike Cornale.

CHAIRMAN CORNALE: Here.

MR. SCHOPP: John Vitzthum.

MR. VITZTHUM: Here.

MR. SCHOPP: Rich Kiefer.

MR. KIEFER: Here.

MR. SCHOPP: Diane Iverson.

MS. IVERSON: Here.

MR. SCHOPP: Howard Zimmerman. Joan Huisman.

MS. HUISMAN: Here.

MR. SCHOPP: Gibs Nielsen. We have a quorum.

CHAIRMAN CORNALE: At this time, sorry,

I'd just like to quickly address the process again. There were a few questions. First part of the process is you need to make sure that if you're interested in speaking that you get signed up. That's very important. As the applicant goes through their testimony, interested parties within the audience will be allowed to question the applicant's individuals after they're all through. That's why I asked last night to go ahead and jot down any questions that you may have of them. They'll present their whole case. From that point, we'll do the questions that I spoke of. Then we'll allow the interested parties, that's the individuals that have signed up, to present their testimony, their evidence, whatever they may have. When they do that, they will have to be sworn in.

Additionally, there will be public comment from anyone that does -- would like to speak. Again, sign up so that we can go through it in an orderly fashion. After that's completed, in reverse order we'll do closing comments, closing statements by both sides. So if you -- if you speak once, address the board, you may have some questions. The questions are -- you don't need to sign up to ask

the questions. If you're an interested party, you'll speak and you'll get to speak again in closing, okay, in reverse order. So be sure -- the most important thing I'm trying to tell everybody is if you'd like to speak, please sign up. Okay.

With that, we'll go ahead and start where we left off last evening.

MR. BLAZER: Actually, Mr. Cornale, if I may ask a question first. Mr. Luetkehans introduced himself yesterday, he indicated that he represents something called United Citizens of Livingston County. He advised me that privately it's an unincorporated association. We have no idea who or what that is, who it belongs to. Since it's an unincorporated association, evidently there are individual members, so I think it's appropriate to get on the record who Mr. Luetkehans actually represents.

MR. LUETKEHANS: Yeah, I was asked for that last night and we will provide that at the beginning of the hearing tomorrow.

MR. BLAZER: Thank you.

MS. BLANK: Testing, okay. Hi, my name is JoAnne Blank, and I did speak a little bit last

night about shadow flicker and introduced myself then.

MR. LUETKEHANS: The mic's not on.

AUDIENCE VOICE: Speak up.

MS. BLANK: Okay. There we go. I tend to move, so I'll try to keep my head still. My name is JoAnne Blank, and I'm here to talk tonight about the compatibility study that Stantec completed to compare the compatibility of the land use within the project area to the Livingston County's goals and objectives to see if the project is compatible with the overall of the plan.

One of the main points of the plan is that it stresses the importance of agriculture and the desire to preserve the agricultural economy throughout the county. In doing this, they identified goals and objectives within seven categories. Three of the main and largest major land uses of the area in the unincorporated area is agriculture, which is the largest and the part of the plan that's given the most, the most importance.

These are the seven objectives and goals within the plan, and I'm going to just talk very briefly about each one.

The first one is agricultural land, and as I mentioned, it is stressed throughout the land use compatibility plan. Plan strives to preserve the most productive and suitable lands for agricultural purposes, and it encourages the prime farmland preservation and supports ag land for future generations. 98 percent of the project area is agricultural land use on prime farmland soils or soils of statewide importance. Wind energy is actually very compatible with agricultural land use due to the extremely small footprint of the facilities.

Approximately 150 acres of the total area in the project area will be used for the wind facilities, and that's out of 36,000 acres of land that will be under contract and over 58,000 acres within the project area. That's less than one-half of one percent of the land that would be taken out of agricultural use to be used for the facilities. In addition to the limited land use, the money that's paid to the landowners will help to preserve the farmsteads for future generations.

Pleasant Ridge has also proposed an agricultural impact mitigation agreement and you

heard a little bit about this last night, and that plan helps to ensure the protection of the prime topsoil by isolating it from the subsoils during construction. It preserves the agricultural practices by burying collection lines more than five feet deep. It addresses drain tile damage and repair.

The second objective of the plan is residential. The plan strives to provide opportunities for housing, wind energy, and the project area is dominated by single family, rural residential properties and farmsteads. There aren't any large high-density residential areas within the project area and the wind farm will have minimal impact on housing and will not inhibit the growth of rural residential properties.

Third objective is commercial and industrial. The plan encourages the mix of industrial and commercial enterprises and it strives to provide a healthy tax base. Here, again, the project is compatible. It diversifies the economic base and increases the tax revenues by millions of dollars. Monies paid to the landowners and the neighbors and workers within the community will

trickle down and increase the spending and boost the economy.

The fourth category is transportation. Transportation in the plan, they promote the development of an efficient transportation network. The project will not require any new roads and any roads that are improved for construction will be constructed at Invenergy's expense. The operation and maintenance of the wind farm will not require a large amount of traffic on public roadways.

The fifth category is utilities. The plan promotes the availability of utilities. Here again, the project uses minimal utility services. They will be constructing a nine-mile transmission line from substation to the point of interconnection. That will be paid for, again, out of the project's expense, not landowner's or taxpayer's expense.

Sixth category is open space and recreation. The plan promotes the retention of open space, preserves recreational areas, wildlife habitats and historic and archeological resources. The project is a majority of ag land as we discussed and it doesn't contain large areas of recreational open spaces. The architectural and cultural

resources are being evaluated through coordination with the Illinois Historic Preservation Agency and turbines are kept more than 20 -- excuse me, 2,000 feet from cemeteries. The Vermilion River will be crossed using a horizontal directional drilling method which is a subsurface method, so there will be no impacts to the Vermilion River. The project is designed to minimize impact to woodlands, wetlands, waterways and it will not conflict with open spaces or recreational lands.

And last but not least is the environmental and natural resources. The Livingston County plan fosters a wise and beneficial use of land, air and water. The project is working with the Livingston County Soil and Water Conservation District to ensure that it complies with these goals. Construction activities will be carried out in compliance with the Illinois Storm Water and Erosion Control Best Management Practices. Will acquire permits through the Illinois Environmental Protection Agency before construction.

Overall, wind energy produces usable power from a clean energy source that does not consume natural resources in the production of that power.

Overall, Pleasant Ridge supports the long-term viability of agricultural and farming practices in the project area.

As we can see here, one of the main objects that we talked about was the agricultural land use and preserving that land use. And as you can see from this figure, the project area is dominated by that land use.

The project -- the plan promotes the preservation of prime farmland, the agricultural way of life in the community for the present and future generations, and we believe that the project is consistent with the goals and objectives of the Livingston County Comprehensive Plan and the land use planning.

MR. BLAZER: Mr. Chairman, I actually left Ms. Blank's exhibits here yesterday. I think they're in that box out there. They are, let's see, 42 and 45. Those are collated.

CHAIRMAN CORNALE: All right.

MR. BLAZER: You should have those on your list.

CHAIRMAN CORNALE: Yeah, we got them right there. Okay. All right, we need to sort through

the stack. The County will accept these exhibits. They are marked. I'll just go through them quickly on this so that they get in the record. Pleasant Ridge Exhibit 42 is Blank -- Ms. Blank's curriculum vitae. 43 is a shadow flicker report. Pleasant Ridge 44 is the Comprehensive Plan Report. And 45 has already been taken, but it's the Power Point presentation from Blank.

MR. BLAZER: Mr. Chairman, our next witness is Michael Hankard.

CHAIRMAN CORNALE: Very good.

MR. BLAZER: Hang on, we have his presentation. Pleasant Ridge 50 is Mr. Hankard's presentation.

CHAIRMAN CORNALE: All right. County will accept Pleasant Ridge Exhibit 50 as Mr. Hankard's presentation, Pleasant Ridge Wind Energy Center Noise Analysis Results.

Two other notes to mention. Cell phones, if you guys have them, if you could silence those. And we did talk to them in an effort to try to streamline taking these exhibits, so bear with us, but we're working tonight to make it a little bit better than it was last night.

With that, Mr. Hankard, go ahead.

MR. HANKARD: Okay, thank you. Good evening, my name is Mike Hankard. I am an acoustical consultant, otherwise known as an acoustician and sometimes called the noise guy. My profession involves the measurement and analysis of environmental noise and what is in the environment due to manmade sources as well as natural sources.

I'm here to speak to you tonight about two issues. First and foremost, I want to present the results of the noise analysis that we conducted that will demonstrate that the project will meet Illinois Pollution Control Board noise limits.

Secondly, I'd like to speak to the issues of low frequency noise and infrasound that have been much discussed with relation to wind turbines in both the press, on the Internet and in my scientific community.

A little bit about my background. I'm in my 25th year in this profession. I have been principally involved in the noise analysis for approximately 400 projects. Those have been located across the United States and internationally. I say principally involved because I own my own firm. I

have so for 20 years. So when I'm hired, it's me. And I have to not only design the study, understand the limits, conduct the study, but I have to stand by the study. And as an independent consultant, my representation does indeed mean a lot to me. So with all of my clients, Invenergy included, I don't ask them how to do the study. I tell them how it should be done.

Over the years I've worked on a number of different projects and various industrial facilities, conventional power plants, wind turbine facilities, mining operations, et cetera. In the last six years, my overwhelming focus has been wind turbines. But that focus is based on my foundation of 25 years experience working in a number of different industries, different projects, different locations, different regulations.

So my wind turbine experience. First and foremost, this involves the California Ridge measurement survey that I conducted. It's obviously relevant because it's in Illinois. It's in a similar agricultural community. It involves similar turbines. And it involved demonstrating compliance with the Illinois Pollution Control Board limits.

You'll hear throughout my presentation and perhaps those from others that wind turbines are different in terms of noise and in terms of compliance, and one of those primary differences is the need to measure for long periods of time. That is because these are controlled by the wind. So we can't go out there on any given Tuesday and measure it and say that's what it is. You have to measure over a wide variety of conditions.

On one of my projects, I've been measuring at a single place for six years. For the last two and a half years, we've been measuring there continuously. That kind of experience is fairly rare in my profession, so I believe that I am very well-qualified to be talking to you tonight about these issues.

Lastly -- well, excuse me, two more points. I was involved with a project recently in Wisconsin where I testified before the Public Service Commission on all of the turbine noise issues that will come up as part of these proceedings. So I'm very versed in what the scientific community says about these issues and what public service commissions have said about

these issues.

Lastly, I was the principal acoustical consultant for the Shirley Wind Project in Brown County. I did all the pre-survey work there, I did all the compliance measurements, including low frequency and infrasound measurements.

So in closing, this slide lists a few more projects. But, you know, in summary, I've spent hundreds of hours out in farm fields listening to turbines, measuring turbines, hundreds of hours listening to audio recording of these same sources and thousands of hours analyzing the data.

Okay. Noise 101 as we say. Noise is measured, and what we hear, what hits our ears, are pressures fluctuations. It's the pressure of the air being changed by the source. We can detect an enormous range of pressure. And we engineers quantify that in pascals, which is the metric unit for pounds per square inch. PSI is also pressure.

The range that the human ear can detect in terms of pressure is huge. You can see it on the left side there of the thermometer. So I don't want to be up here talking about 20 pascals or 200 million pascals. So what we have done in the

acoustics world is to compress this scale down using the logarithm, and the resulting scale is much easier to discuss. It ranges from zero dB at the threshold of hearing; you know, 20 to 30 dB is a very, very quiet night when the wind isn't blowing; 30 to 40 the wind's now blowing; 50 to 60 you're inside watching TV; 70 to 80 you're talking about, you know, being next to a highway. And then you get into, you know, rock concerts and rockets and things like that.

One quick note on adding decibels. Because we have jumped into that logarithm world, 50 plus 50 no longer equals a hundred. It's because these things are related to each other on the square of the pressure. So there's not going to be a quiz or anything at the end here. I'm just trying to convey that when you're adding 50 plus 50 in the noise world, that equals 53.

All right. One more scary technical graph here and we'll get to some data. I like to use the analogy -- the concept I'm trying to get across here is frequency. And it's important to discuss this if you don't understand it, because the Illinois Pollution Control Board regulates noise at different

frequencies and we're going to be discussing low frequency noise and infrasound.

So think of an ocean wave. The higher the wave, that's the level, that's the decibel level or the pressure. And then the distance between each successive wave is the wavelength. And so the lower the frequency, the longer the wavelength. And I'll discuss more why that's relevant and important later in my talk.

So just to put things in perspective for you, human speech ranges from approximately 500 to 4,000 hertz. A train horn you can see is 300 to 600 hertz. If you're standing out in an Illinois cornfield, as I have done, and there's distant trains quite often, and you'll hear that rumble, that lower rumble that's more in the low frequency, 10 to 200 hertz range. And the whole thing is summarized quite well by the analogy of the piano, which ranges from about 30 hertz at the very low end to 4,000 hertz up high. So I can play any note on the piano and I can play it soft or I can play it loud and it doesn't change the frequency. If I hit one note, the frequency is what the frequency is. And then I can change the level depending on how

hard I hit the key.

Okay. We're getting there. So the human ear can detect frequencies between 20 and 20,000 hertz and that's for a young healthy person. Now, the Illinois Pollution Control Board only regulates noise between 22 and approximately 10,000 hertz. There's good reasons for this. Most environmental noise sources, wind turbines included, don't produce that much sound above 10,000 hertz. Furthermore, the atmosphere tends to absorb it. Thus when you get out to, say, 1500 feet from a turbine, there's simply no or very little high frequency noise left. So we don't need to concern ourselves above 10,000 hertz. Below 20 hertz is inaudible and, therefore, in that sense we don't need to concern ourselves above that.

That said, this infrasonic region, below 20 hertz, infra meaning less than, so between zero and 20 hertz which has been classically thought of as inaudible, some have postulated that energy from wind turbines in that range is audible or, if it's not audible, it might cause health effects.

I'll talk tonight about the audibility aspects and I'll leave the health effects to

Dr. Roberts and Ellenbogen.

One last note. The low frequency noise that people talk about, that ranges from approximately 20 to 200 hertz, and you can see that is covered within the Illinois Pollution Control Board limits.

Okay, so here are the Illinois Pollution Control Board limits. And so they have broken it up into there's actually nine units. They took the frequency spectrum that we're concerned about, down low, around 20, 22 hertz up to about 10,000, they broke it up into these nine bands, and these are the center frequencies of each band. And each band has a limit. These are the nighttime limits. The daytime limits are all five decibels higher, but because we're designing the project to meet the nighttime limits, we really don't need to be concerned about the daytime limits. They will be met and exceeded -- or not exceeded, but the levels will be lower than the limits.

So one last thing on this graph. As you notice, the limit for the low frequency is much higher, and that's because the human ear is not as sensitive to these lower frequencies. The human ear

is most sensitive at a thousand hertz and then it drops off as you go lower and higher, so that's why the curve is shaped the way it is.

Okay. So I mentioned that we measured turbine noise at California Ridge down in Vermilion County, Illinois. So I've plotted the results of those measurements here. These levels that I'm showing are the very maximum levels that we measured in the California Ridge. And I mean the very maximum. This is not some kind of an average. And you can see that we are below the limits in all of the bands. Now, we're closest around 500 to 1,000, and so we'll keep an eye on that as we move forward.

So on that California Ridge project, we measured in August and we got a few days of data that were similar to these levels. But the wind didn't blow that much, so we kept measuring. So in September, we got some more good data. Again, the levels were very similar to what you see here. But we still didn't feel like we had captured enough data, so we kept going through October. We ran -- in October, you run into harvest season. And combines and the like produce noise very much in the 500 and 1,000 hertz band. So October was a little

challenging for us even though the turbines were running quite a bit.

So we kept going. In November, we got a lot of great data, covered a lot of different wind conditions. Harvest was at a minimum, and really that's when you see here is the max that we got in November, which was similar to the other months, but this is pretty much what you're looking at.

What I have plotted here against the Illinois regulations are the predicted levels for this project. So this is what we think in a very maximum way will be the levels that the Pleasant Ridge Project will produce at the nearby residences. And so I chose to show you the very highest levels.

For example, we're considering two different turbines, one with two different blades. One blade is a little louder than the other. This is for the louder blade. This is for the levels predicted at the very highest residence. So all of the residences will have lower levels. So once again, you can see that it's the 500 and 1,000 hertz bands that we're kind of close to.

So I'm going to tell you how we feel that these are the very, very maximum levels in that an

overwhelming majority of the time the levels will be lower. But to do that, I need to kind of walk you through the process that we acousticians use to make those predictions.

So it starts with the manufacturer, GE in this case, going out to a test facility. And there's a standard. It's this International Electrotechnical Commission 61400-11. They follow that standard and it roughly involves them placing a microphone or a series of microphones about 4 to 500 feet from the turbine. They allow the wind to kind of do its thing and they wait until the wind has blown through an entire range of speeds and they capture all the data and they reduce it down and they come up with what's called a power level.

Now, when you're out at that distance from the turbines, what you're measuring is what's called aerodynamic noise. It's the blades cutting through the air. So the gears inside the turbine, the cooling system, any of the motors, once you get out to 1500 feet and beyond, that's not really what you're picking up. It's primarily the interaction of the blades with the air. And the faster the blades turn, generally speaking the louder the

levels.

Okay. So this is a table that GE or any other manufacturer would provide. And I don't -- you don't need to fully understand the table here, but basically this is increasing wind speed and this is frequency. So on a standard project in a stage -- or a community that has a single number regulation, we would simply choose perhaps the highest level and run with that to do a worst case analysis. But because the Illinois Pollution Control Board regulates each band, we actually went through each band and said what's the highest level in each band. And you can see I've highlighted those here. And it's not always at the same wind speed.

So for our critical bands at 500, it's at 7 meters per second. But for 1,000, it's way out here at the higher speed of 10 meters per second. So this is one way that we really try to do a worst case analysis by picking the loudest levels in each band.

So again, as you've been told, the project is considering both 100 meter and 103 meter blades, so we ran our analysis for both blades. And the

results I'm showing you here are for the 100 meter because those are a little bit louder.

Now, when you design a wind turbine project, you determine where the turbines go based on all different kinds of constraints, roads, wetlands, noise, et cetera, available land, and eventually you get kind of close to where they're going to go. We got to that point on this project and we were a little bit over the noise limits, so that's when we started adding in these turbines with the lower, the low noise trailing edge blades.

Initially, we found out we needed four of them on the turbines, that I believe we went over where those are last night. Then at one point I said to the project, you know, we're actually one to two-tenths of a decibel over the limit in one of the bands. And they said, well, what does it take to get rid of that? And we said another 7 LNTEs. And Invenergy said, fine, let's do that.

So I think it reflects on the type of analysis they wanted us to do, being very conservative.

Let me use the analogy of the lightbulb here. I told you we just measured the power level

of a turbine, how much sound does it put out. What we really want to know is how does that sound travel out and reach a residence that's, say, 1500 more feet away from the turbine.

If I take a 100-watt lightbulb next to my bed and I read a book, I'm going to be just fine, plenty of light. If I was to go outside with that same lightbulb and put it a hundred yards away from me and sit out in the field at night and try to read, I'm not going to have enough light. That's because when that power gets emitted from the bulb and it travels through the air, distance makes the level go down. If it was foggy, for example, there would be even less light. Well, it's the same with noise.

So the way we mathematically predict how it's going to go from the turbine to the residence, we follow this International Organization For Standardization, ISO, Method 9613. So it starts with the emission levels. You cannot correct for directivity. Some sources are direct. They put out more sound in one direction than another. Like a household fan is similar to a turbine. It's going to produce a lot of noise when you're facing it or

behind it, but not so much to the side.

Divergence refers to how the wave spreads out. So it starts from the turbine and it spreads out, and it has to cover more ground the further it goes, so it loses energy, and that's why as you walk away from a source, it gets less loud.

Atmosphere absorption. When the sound travels through the air, the molecules are bumping into one another and tiny amounts of heat are created, so you have sound energy transferred to heat energy and there's a little bit of loss and so the level goes down.

Ground effect. Again, when a wave is coming off a turbine, it's going in all directions and the wave that goes along the ground interferes with the wave that's going through the air, and there's a loss that occurs there. That's called the Brown effect.

Barrier. If it comes across, if the wave comes across a barn, you get behind that barn, there's going to be a loss of noise.

Vegetation. If it travels, if the wave travels through a stand of trees, again there will be a loss of sound energy.

Meteorology, i.e., weather conditions, are very important. We've all perhaps experienced some nights you can hear that highway a mile away and some nights you can't. Has a lot to do with the wind direction. Are you downwind of the source? But it has to do with other things as well, including what's called a temporary inversion. Typically at night it gets colder as you go up into space, right? As you get higher in elevation, it gets colder. But there are some nights when that doesn't happen. It's actually a little warmer above, and then it starts to cool. But that warm blanket of air causes a bit of a cap, if you will, and some of the sound energy bounces off of that cap and it can be louder as a result.

So I'd like to briefly walk through each -- how we modelled each one of these and how I can stand here and tell you that it was a very conservative analysis.

So, first of all, the ISO method is the method that's used to predict noise on practically every project in the United States, wind turbines, industrial facilities, any kind of facilities. So I already told you how we chose the absolute maximum

power, so that's where we started. Directivity, we took no real deductions. Turbines do not put out as much noise in all directions, but we assumed that they would, even though that's not the case.

In terms of divergence, there's really no choice in the model, so there's nothing, no choice there.

Atmosphere absorption. We chose the lowest possible deduction. Ground effect, we assumed that the ground was not going to interfere with the direct wave. We took no deduction for that. That's not often the case. Most people take a three decibel correction for that. We did not.

We assumed no correction for barriers. Yes, someone might have a barn between them and the turbine, but sound can also -- realistically it can reflect off of a barn, so we took no corrections either way there.

Vegetation. Sometimes there will be stands of trees between you and one or more of the turbines. They may or may not have leaves on them all year. To be conservative, we took no deduction there.

In terms of meteorology, the ISO method is

stated to be for downwind conditions for a temperature inversion, so it's fairly worst case. So overall, we did a very, very conservative analysis.

So just to summarize that, that part took the loudest emissions, took the least amount of deductions. We predicted for a condition of the atmosphere that is known to produce relatively higher levels, but we'll talk about this in a minute. We compared all this to what we measured because, so far, I'm talking theory. We wanted to go back and see how does our theory match reality, but I'll talk about that in a minute. Bottom line is all the levels are below the Illinois Pollution Control Board limits. And I think compared to our predicted levels, the actual levels will be definitely below.

There are a few critics of this whole process. They will make claims and I do not disagree with many of their claims. They say that, hey, when GE goes out and measures those turbines, they only spend a few hours, few days, maybe a week and they may not capture all the atmospheric conditions. That's true, they may not. They say

that the ISO method, yes, it's for a downwind temperature inversion, but it may not be for that one night a year or those two nights a year where it's really a worst case. That's true, it may not.

I've had criticisms levied against me, well, you should then tack on a safety factor, every engineer tacks on a safety factor. My answer to that is, yeah, if you do a standard analysis, maybe you want to. But we didn't do a standard analysis; we did a very conservative analysis.

I've seen criticisms that low frequency noise travels better than ISO predicts. Again, we're going to compare our results to real world conditions to test that. I've seen it printed that you shouldn't, you know, use average levels because averaging kind of hides these instantaneous peaks that might occur.

First of all, the Illinois Pollution Control Board limits require you to do an hour average, so I don't really have a choice there. But as I'll show down the road, we took ten second data and analyzed that to make sure that we weren't missing something there.

So back to our California Ridge study.

Again, we have this model. It's based on a lot of math and a lot of science. But it's a model nonetheless. It's a prediction.

Let's look. We wanted to see how does the model stack up against what we know to be very good sound level data from actual operating turbines. Again, we measured over three and a half months, we captured a wide range of atmospheric conditions, and the study was conducted in association with Mr. Paul Schomer. He lives down in Champaign. He's a 40-year veteran in this field, very respected. And the study was conducted to a very high degree of professionalism.

So how did we stack up? In all of the octave bands, if you remember back to those nine bands that the Illinois Pollution Control Board levies, in all of the bands except 500, our model is overpredicting, so that's good. That means we're even more conservative than we thought. Now at 500 hertz, it did actually underpredict by a decibel, so I made sure we took that into account. Made sure that we were at least a decibel below the limit.

Again, Illinois Pollution Control Board says you must -- it's an hour average. That's the

law. But California Ridge, we actually measured every ten seconds for three and a half months. Every ten seconds the noise meter put the data into memory and we looked at all of that data, and I took the very loudest ten seconds of data to compare to get these results.

So again, we're not trying to hide anything that might be of a short-term nature. Just by reference, when you do an airport noise study, you're talking about a 24 hour average, and the World Health Organization nighttime limits are an annual average.

One more thing on the criticisms that we've heard and seen in the press and whatnot, and that is again related to the long -- you have to measure for a long time. So California Ridge was three and a half months. That's much longer than is typical. Typical noise surveys are a day, three days, a week, maybe two weeks, not but three and a half months.

So on this project I'm working on in the western United States, I've been measuring for years. And when I first started on that project, within the first year we said that the maximum level

was 41 to 42 dB.

So here's the data for that project for the entire year of 2014 from January to October. And it's smashed together so it's not contiguous and this is all nighttime data. And what you see is the level goes up and down and up and down as the turbines are working hard or the atmosphere is changing, but they're not bouncing up and down over what we already know to be the maximum.

So we know what the maximum level is and we know how to design for that and the levels will in reality be less, and I never have seen any spikes that opposition acousticians have talked about that rise above the maximum level.

So I did ask myself, well, why do I not see these claimed spikes and others do? Well, part of the reason is I think that, again, you have to measure for a long time. So we don't sit out in these cornfields for three and a half months; our meters do. So they're unattended. And so when you measure, you're measuring everything: cars, airplanes, trains, wind turbines, wind, birds, everything. So you have to separate the wheat from the chaff, if you will, because the Illinois

Pollution Control Board regulation is just turbines. It says, well, what's the level of turbines, not what's the level of everything.

So I've developed a number of methods that -- let me back up. These graphs are from California Ridge and each is an hour. So this is ten o'clock at night and all of these are cars that are going by on the roadway that's a few hundred feet from the microphone. And interestingly, you can see at ten o'clock at night, there's some traffic. Eleven o'clock, a little less. At midnight, very little, into the late, 1:00, 2:00, 3:00, and of course by the time you get to 6:00, there's all kinds of traffic again. So we have developed methods to separate out the wind turbine noise, which is this underlying data here from all these spikes.

One advantage I have when I'm working for Invenergy or another turbine farm developer, I have access to the data that tells me when the turbines were operating and when they weren't. If you're an acoustician working for an opposition group, you often don't have that data. Having that data allows me to better separate the wheat from the chaff, the turbine from the non-turbine. And perhaps these

other people are missing some of that.

Okay. On to phase two of my talk. Thank you for your patience. Talking now about infrasound and low frequency noise. So back to our audible frequency spectrum. It's from 20 to 20,000. So now we're going to focus -- first, I'm going to focus on low frequency, which is 20 to 200, and then we'll get into infrasound which is zero to 20.

The primary points I'm going to make are that wind turbines do indeed produce low-frequency noise, they do indeed produce infrasound, but so do a lot of other things. These noise levels are in our environment due to traffic, trains, wind, all kinds of different sources. I'm going to talk about levels, noise levels.

I'm an acoustics guy. I'm the noise guy. I will leave the health effect aspects of these issues to the doctors.

All right, back to some Noise 101 real briefly. Again, I mentioned earlier that the lower in the frequency you go -- so these are high frequencies. When you get to low frequencies, these have a much longer wavelength. They can get to be 10, 20, 100 feet long. They do go through a house

more easily. So that's a true statement. Your house is able to block out the high frequencies much better than the low frequencies. People perceive the difference in low-frequency noise more easily than they perceive the difference in high-frequency noise. That's a known fact. I admit that and I agree with that. But by the same token, we don't hear these low frequencies as well, as I illustrated earlier with the higher allowable levels under the Illinois Pollution Control limits.

So this lot here, I brought back the Illinois Pollution Control Board limits and I've brought back the loudest predicted Pleasant Ridge levels and I've highlighted three octave bands that cover our low-frequency noise range. And as you can see, we are below the limit. And I think these predicted levels are a little high based on our comparison to California Ridge, so they're probably more like down here. So in terms of low-frequency noise, we meet the Illinois Pollution Control Board limits.

Here, I'm comparing our predicted Pleasant Ridge levels, but now we're talking inside because I'm comparing it to a different criteria. It's

called the preferred noise criteria. It's used by architects to design a facility like this. It's like what is an acceptable level of noise inside. And it's usually related to the ventilation system or what have you, but I'm just using it as a guide here.

So these, this is what architects consider an acceptable level inside a residence. And so we took our outside predicted levels and we used the -- the Netherlands, of course, has a bit of experience with wind turbines and they have published a good set of how much noise reduction does a house provide over the frequency range. So not as much down low and much more up high. So we used those to convert our outside numbers to inside numbers to compare to this inside criteria. And as you can see, we're below that criteria.

So now I want to talk a minute about, well, what low-frequency noise is out there as it is? So this is a level, what's called a level versus time lapse. So you have our three different octave bands that are low-frequency noise range and this is two hours of data taken at California Ridge in November when the turbines were operating at full

capacity. In fact, the entire wind farm was working at full capacity.

And so you can see that these spikes, they're traffic, we know that. We listened to the audio recordings. We looked at the frequency spectrum. There was no question in our mind those were traffic. So that's not what we're concerned about. We're concerned about that this is what the turbines are producing. So if you can see it's -- for the 31 hertz band, it's a little under 60. For the next band, it's about 54. And then for the 125 band, it's about 47.

So this is all of the nighttime noise levels in the 31 hertz band measured at California Ridge just plotted out in time. So this is turbines and it's winds and it's trains and it's traffic and it's everything. I didn't doctor the data or remove anything; this is just what is out there. And here is what we know the turbines kind of max out at in this band. So sometimes the turbines produce more noise than what's out there, sometimes they produce less noise, so they're roughly in the middle. So low-frequency noise is out there, turbines or no turbines.

We look at the next band, the 63 hertz band. Once again, kind of in the middle of the pack. And finally on the 125 band, we're actually on, kind of on the low end of things. So traffic, trains, et cetera, are producing more low-frequency noise than the turbines will. Not at all times, but overall they produce either less or more noise.

So lastly, this plot here is the threshold of audibility that is used by almost every textbook. It's part of standards. It was relied upon by all the medical studies that will be talked about, or at least most of them, so it's very, very well documented.

So here are our maximum Pleasant Ridge levels. Now, we only go down again to 25 hertz, so we're talking about low-frequency noise right in here. So when it's above the line, when the black line -- the turbine noise is above the blue line, you'll hear it. And when it's below, you won't. So around 40 to 50 hertz, it will be audible.

So again, I'm not here to tell you that these turbines are not going to be heard, that they're not producing some low-frequency noise, but they are just above the threshold of audibility.

And when you get below approximately 30 hertz or so, 30 to 40 hertz, they would be inaudible.

So in summary, on low-frequency noise, we meet the Illinois Pollution Control Board limits. We meet the preferred noise criteria. There will be some audible low-frequency noise, some of it won't be audible, and it's turbines produce low-frequency noise in the range of what's produced by other sources.

All right. My last subject. So again, thanks for the patience. Let's talk now about infrasound, so this is below 20 hertz, this is the lowest of the low. This is a chart that was recently produced by the South Australian Environmental Protection Agency, and they're trying to answer the same questions down there that we're trying to answer up here in the States regarding infrasound and turbines.

So they measured infrasound from a number of -- in a number of places. Some of them were in and around operating wind farms and some of them weren't. So the whole idea here is, well, do wind turbines produce a lot of infrasound or are they kind of in the mix with what's already out there?

And that is indeed the case.

So these yellow squares are the ones near the turbines. Just a word, this is a different scale here. We -- it's kind of an infrasonic scale, but I'm not concerned about the scale here. What I want you to take away from this is here's the turbines in between, say, 40 and -- - excuse me, I guess that would be -- yeah, 50 to 60. Well, here's a bunch of infrasound from sites that had no turbines near them at all. And again, they are similar, sometimes higher, sometimes lower.

Some of these other sites I think were urban, so I'm not trying to compare to those, but for these that are all down in agricultural territory or open rural territory, again the levels near the turbines were very similar to the levels that were taken not near the turbines. And the threshold of audibility on this dBg scale is right here at 85. So you can see all the infrasound that was measured near the turbines is below the dBg audibility threshold.

So the Shirley Wind Project in Brown County, I've spent many, many hours up there measuring, analyzing that data. One of the surveys

that I did, we shut down the entire wind farm. A lot of times when you do these infrasonic measurements, the question is, well, are you measuring the wind blowing against the house or are you measuring turbines? And the only real way to know that is to measure and shut the entire park down and measure again in like -- within like a span of minutes, you know, ten minutes, so that your conditions are the same.

So I had the opportunity to do that. I went to one of the homes that had been abandoned. It was about 3,000 feet from a 2.5 megawatt machine. Those are a lot bigger than what we're using on this project. The wind farm was operating at 100 percent capacity. And I took measurements with the entire wind farm turned off in many different rooms of the house. And then we brought the whole park back on line and we measured again.

So I'd like to show you how those on and off measurements compare. So I measured in four different rooms. Here's the first one. The green lines are with all turbines off and the red lines are with all turbines on. And kind of circled this lower range because that's what we're talking about,

this infrasonic range of 6.3 to 20 hertz.

Now, my measurements equipment on this project only went down to 6.3 hertz. I didn't go down to zero hertz or 1 hertz. That's just the equipment I had at that time. But you can see with all the turbines off, in the kitchen, the infrasonic levels are actually highest with the turbines off. With the whole park running, they're a little bit lower.

You go to the living room. Now the green line is kind of in the middle. So again, it's in the middle of the pack. The levels were a little bit higher with the turbines on for ten minutes or so; a little bit lower; the off measurements are in the middle of the pack.

Upstairs bedroom, middle of the pack once again. Upstairs hallway, kind of similar, on the high side here, but then in the very low range, the off levels were the highest.

So I mean I'm not trying to say again that infrasound from turbines doesn't exist. It's just in this case with this wind farm operating at full capacity, there's no clear indication to me that the infrasound from the turbines was any different than

what was there without the turbines.

Okay. So back -- sorry about that. Back to our threshold of audibility. So also at the Shirley project back at the end of 2012, as part of a hearing that was taking place for another proposed wind farm in Wisconsin, the Public Service Commission in Wisconsin put together a study and commissioned four different acoustical consultants to go and take the highest quality infrasonic measurements that they could possibly take at a house that had been abandoned near the Shirley Wind Farm. So I consider these to be pretty much the highest quality infrasonic measurements that have been taken in this country from wind turbines. They are incredibly below the threshold of audibility. Like let's say at 10 hertz, they're 40 -- 60 decibels below. Down at 1 hertz, if this were to carry over, maybe 40 decibels below the threshold.

Now, these levels were taken 1250 feet from the 2.5 megawatt machine, so most likely higher levels than we would experience on this project because we don't have 2.5 megawatt machines; ours are 1.7s.

I'd like to put into perspective the 40 to

60 decibel difference. That's -- in the noise world, that's huge. We try to take -- we usually -- you know, 5 decibel change, 10 decibel change is kind of significant. 40 decibels would be kind of like the speed limit. If you had a road that was posted at 60 and you just decided to drop the limit to 20, it's that kind of change. So we are just orders of magnitude below this threshold.

So back to what critics would say to this analysis. And they would say, well, there must be something wrong with your threshold. To that end, some researchers named with the last name of Salt and Hullar have conducted studies on guinea pigs where they introduced into the guinea pig's ear what's called a biased tone and they made a bunch of assumptions and related that then to the human ear. And they say that, well, as a result of our testing on the guinea pigs, we think the threshold should be lowered by 40 decibels.

Some more recent testing in Munich tried to take the same kind of testing to the human realm. And they did some testing with humans, but they used really, really high levels, much higher than turbines will produce. So I don't really see how

that's relevant. So what Salt and Hullar have proposed is this lower threshold based on what's called the outer hair cells. And those are within your ear.

I'm not going to go into any detail, but traditionally we have thought of sound getting into the brain via what's called the inner ear cells. Salt and Hullar have proposed that, well, in this infrasonic region it's really the outer hair cells that matter.

Here's a chart from their report, and here is the traditional and accepted threshold of hearing way up here, and here's their lower one based on the outer hair cell theory. So I said, well, let's have a look at our levels or the Shirley levels, which again I consider to be very high quality. And you can see down here in this infrasonic region, I mean we're still -- we're still below that threshold. I mean it's kind of -- even if you give people the benefit of the doubt here, we're still below the threshold.

Now, we do cross over the threshold down here around 20, 30 hertz. Yes, I believe that -- you know, I believed that before and I still believe

that.

So I consider this a theory, this outer cell, outer hair cell threshold, it's a theory. They're good scientists I'm sure, but I don't see how testing on guinea pigs, and us being so far below even that, I don't see it as the aha moment that the Internet seems to portray those results as.

All right, we're almost there. I think I only have three slides left, just so you know. One other theory that has been proposed to try to explain the claims of health impacts due to low -- due to infrasound was based on a Navy study.

Back in the 1980s, the Navy noticed that its simulator pilots were getting sick, they were vomiting. And so they did a study. They said, well, let's find out what's going on here. So they put people in a machine that physically shook them at various frequencies and at various intensities for hours and they measured how long it would take a person to throw up. And they -- - I have a hard time getting my hands around this graph, so I don't expect you to per se, but what they're saying is when this curve dips, it took less time for someone to vomit. And so right here in the zero to 1 hertz

range is kind of the sweet spot.

So this theory -- so Paul Schomer who I mentioned earlier, he's a friend of mine, he's a colleague, I respect Paul. He's the one that has brought forth this theory. He has said, well, if people are claiming to have health problems that are similar to seasickness and the Navy had these people getting sick and the frequencies and intensities that we're talking about are the same, Paul has theorized that maybe by shaking the body, that's the same as the air shaking your ear, because, you know, the turbines are creating these pressure fluctuations, and he's saying, well, maybe that's the same effect.

Paul himself calls it the motion sickness hypothesis. He's throwing out a theory to be discussed. Others have taken this as kind of proven. And I don't even think Paul would make that claim. Me personally, I find it hard to see how shaking an entire body for 30 minutes up to eight hours is the same as sitting in one's room and having the air move. That's a big stretch for me as an acoustician to take.

Furthermore, Paul says that once you get

above 1 hertz, you're no longer in the sweet spot. And yet, some of the sickness claims have taken place at distances and near turbines that don't produce anything down this low. So to me, that doesn't match up with Paul's conclusions. It's a theory, but I'm having a hard time getting on board.

All right, this is my last point before a quick summary. So this is a chart that was produced by two acoustical consultants, one named Rob Rand and Steve Ambrose. I know these fellows. I used to work with them years ago. I like them, I respect them; I just don't agree with their conclusions.

So what they did was, the base of this chart is from the 1970s. The United States EPA developed a method for predicting how communities would react to a new source of noise. It was largely centered on highways and airports.

My problem here is that Steve and Rob Rand took this scale -- you can adjust this. The method allows you to adjust this scale. They took all of the corrections that you could possibly take and they kind of, they said, yeah, you know, we're going to take all the corrections, we're going to slide the scale all the way over. And in the end, what

they concluded is if you have a project with wind turbine noise levels here at, say, in the mid-40s, like our project, you follow it up to this trend line and you say that you can expect strong appeals to stop the noise and you can expect widespread complaints.

Also on this graph is the results of a oft-cited research conducted by some Swedish and Danish researchers which looked at a noise to wind turbine noise. And again, they have taken that data and thrown it over the scale that's been slid, and they are saying that at our noise level, 45 percent of the population will be highly annoyed by the noise from wind turbines.

Now, again, in my opinion, this is just postulation. They took a decades old procedure that was geared towards highway and airport noise and they slid the scale all the way over and they come up with a rather dire projection. So I'd like to compare, however, how that projection stacks up against reality.

On the left side of the screen is a letter that we received from the Cayuga Ridge project which states that since 2010, when they began operating,

they have had no noise complaints. Zero. There's a company called Hessler and Associates. They are acousticians like myself. They've done many, many wind turbine studies. They claim a range of 2 to 5 percent. And a quick correction, I was reading my notes this morning or yesterday, and I came across a different number of 2 to 7. So I will -- let's call that 2 to 7.

Health Canada recently -- you'll hear more about this study -- developed a large study that just came out. They issued -- I forget the number, but it was hundreds if not a thousand questionnaires, but that's subject to check. But what they found is they studied two provinces. Prince Edward Island, 6 percent of the people responded that they were bothered by noise. In Ontario, 16 percent responded similarly. But there was a lot of anti-wind turbine information being circulated which can influence the results.

In Benton County, Indiana, Purdue conducted a study and they went out and asked hundreds of people what they thought. And 7 percent said they sometimes felt bothered by the noise. And these are all people that live in wind farms. These

are not people that live, you know, miles away.

So the 45 percent projection does not at all stack up with reality; certainly not here in the Midwest.

Okay, this is it. This is my last slide. It's a summary. For this project, for the Pleasant Ridge project, we have sited the turbines at least 1500 feet away from residences. We used a noise prediction methodology that is much more conservative than is typically used in this country. We looked at low-frequency noise and we found that, yes, they could be audible. And critics will also say they have a modulation component. Modulation means the level goes up and down. And that is true. When the blades pass by the mast, you'll hear the whoosh, so it kind of has a little bit of an up and down. So again, the levels are there, but they're low.

In terms of infrasound, we're below the accepted threshold and we're even below some proposed thresholds. And operating wind farms have been shown to not produce significant complaints.

Thank you very much.

MR. BLAZER: For the record, Mr. Cornale,

we have collated sets of exhibits.

CHAIRMAN CORNALE: Very good.

MR. BLAZER: For Mr. Hankard, they would be 46, 47, 48, 49, 50, 100 and 120.

CHAIRMAN CORNALE: All right. All right, the County will accept Pleasant Ridge Exhibit 46 as Hankard curriculum vitae. County will accept Pleasant Ridge Exhibit 47 as the Pleasant Ridge sound study. The County will accept Pleasant Ridge Exhibit 48 as the California Ridge noise report. County will accept Pleasant Ridge Exhibit 49 as the Australian EPA study. County's already accepted Hankard presentation, 50. County will accept Pleasant Ridge Exhibit 100 as the Cayuga complaint report, the letter from Iberdrola. And the County will accept Pleasant Ridge Exhibit 120 as Wind Farms in the Rural Midwest by Mulvaney in 2013.

MR. BLAZER: Mr. Chairman, the next witness has five boxes of documents. I suggest we might want to take a ten minute break.

CHAIRMAN CORNALE: I would agree. Yeah, I've got a quarter after 7:00. Let's try to come back at 7:30. 7:30, so about a 15 minute break. Grab something to drink, hit the bathroom, we'll get

going right away. Thank you.

(Recess at 7:15 p.m. to 7:30 p.m.)

CHAIRMAN CORNALE: Had a few questions from the audience about the process. Just a quick note. So the applicant is presenting their information. When they're complete with that, when they finish, the Zoning Board has the opportunity to question, the audience has the opportunity to question, counsel has the opportunity to question any of their witnesses. That will happen after they get done presenting.

We've done it different ways. Sometimes the questions add to the evening and we don't get through any of their presentation and we get inundated with questions. So we just found this particular method will work the best. So again, I said last night, and Mr. Blakeman, he explained the process, if you have questions, jot them down.

The one thing that will -- - we will be strict about is you will have a question of the witness. That's not your opportunity to present testimony or your information. It's your opportunity to ask a question of their witness. Okay? I hope that helped. If I didn't help, ask me

again and I'll try to explain it better.

With that, Mr. Blazer.

MR. BLAZER: Mr. Chairman, do we go -- did we go through the Hankard exhibits?

MR. LUETKEHANS: Yes.

CHAIRMAN CORNALE: Yes, we did, I accepted them.

MR. BLAZER: Okay.

CHAIRMAN CORNALE: In front of me, I have Pleasant Ridge Exhibit 96, which we will accept as a presentation by Mr. Mark Roberts, M.D., Ph.D., entitled Wind Turbines, Low-Frequency Noise and Public Health Impacts.

MR. BLAZER: And our next presenter will be Dr. Mark Roberts.

MR. ROBERTS: Now it's on. Thank you. My name is Mark Roberts, as this slide says. I'm a physician. I'm also -- have a Ph.D. in epidemiology and biostatistics. I'm licensed to practice in three states: Wisconsin, Illinois and Oklahoma. I carry professional experience. I spent 17 years in the State Health Department in Oklahoma doing rabies, scabies, head lice, asbestos, and issues around landfills and hazardous waste sites. So I

kind of bring all this experience with me to where I am today. I'm the center director and principal scientist at a company called Exponent. I have an office in Chicago.

And so basically what I've been asked to do is come here tonight and talk about the science associated with wind turbines. This is not the first time I've done this. In the second slide, it lists the projects that I've been involved in. I do other things besides wind turbines. In fact, this is a very small part of what I do in consulting practice at Exponent in Chicago. But basically one of the things that I do is I usually ask a question. Does X cause Y or is X associated with Y?

In this particular situation, I was asked is there health effects associated with wind turbines? So what I do is I go into the literature and I use my training as an epidemiologist and my training as a physician and experience of 35 plus years of being in public health.

What is an epidemiologist? An epidemiologist is a person that is trained in finding the reasons for various conditions. Usually it's health conditions, but it could be other

things. There are epidemiologists that study agricultural issues, automobile accidents. Why are fire trucks not always red, sometimes they're yellow? That's because the epidemiology of accidents involving fire trucks indicates that yellow fire trucks are more visible than red, but red is traditionally the color of a fire truck.

So the other thing is the fact that the opinions I've given at various times have showed up in other court actions and that sort of thing indicating that my opinions have been accepted by the federal government and also in U.S. Federal Court. Most recent was in Tule, California, involving a wind turbine project there where I gave -- they cited testimony that I had given while in Wisconsin. So it's not just that I've said it, but it's been approved, it's been repeated in various activities, such as federal court.

That's enough about me. Let's talk about what we're here about tonight, and that's really about noise. You heard a very good discussion about noise. Lots of numbers. And I'm not going to go over those again because that's not my area. My area is actually human response to it and the

literature around it.

But the thing to keep in mind as we talk about this is frequency of that noise. We've heard about the infrasound, we've heard about regular sound, so it's also about sound pressure. And now I'm not an acoustics person, but sound pressure to me is volume. And then we talk about duration of exposure, and that's important to me as a physician in the fact of how long a person's exposed to it. For example, in an explosion, there's forces associated with that explosion, but it's very instantaneous. And then finally the receptor, what is the person -- in this situation, we've heard about guinea pigs, but we're going to talk about people primarily, and what's the person's response to that sound, that noise.

One of the things just to keep in mind, sound is all around us. Right now in this room, my voice in this room is about 55 decibels, something like that, maybe 60 depending. But noises are all around us. But we also use noises. Physicians listen to your heart, listen to your lungs. There are fetal monitors that can listen to the heartbeat of a baby through a mother's abdomen.

So we use noises, we use sounds in a lot of different ways, sometimes therapeutic. Ultrasound, for example. But also volume movement makes noise. Your muscles make noise when you contract. When you contract your arm, your biceps muscle makes a noise. The blood going through your veins, your arteries, makes a noise. So we're surrounded by noise. Many times it's noise that we can't hear. This just depicts some of the more dramatic areas of infrasound.

Infrasound is all around us, as Mr. Hankard stated, but really the point is that noise is all around us. The key to that is the fact that we don't always hear it. We don't appreciate it. We don't respond. Our sensory system does not respond to it. Now, this is -- again, I'm not going to repeat what Mr. Hankard said, but this is to point out that it's not just the frequency. You hear about infrasound, low frequency sound, that sort of thing. The point being it's the pressure.

How much volume do you need -- pardon me, I'm going to take volume. How much volume do you need to appreciate that sound? And we can see from this table it takes a high volume, a high decibel to

appreciate some of the lower frequency sounds. It's important to remember that it's not just frequency, but it's also the pressure.

Now, there have been noise concerns as long as there's been written documentation. Believe it or not, there were health concerns about telephones. There's a thing called telephone tinnitus, telephone ringing in your ear. Not the ringing of the phone, but the fact that it would cause ringing of the ears. There's also things about cars, the unheard sounds of cars. So it's not new to have health concerns about noise.

Now, one of the things is what are of the qualities, and when we get into the literature, we're going to talk a lot about annoyance, but the thing is annoyance is common, it's a normal response. And one of the things to keep in mind, I'm not saying a person's crazy, but I'm saying it's a normal response. When a baby cries, for a mother it might be reassuring that the baby is breathing and doing well. It might be that the baby's hungry. It might be that the baby's diaper needs to be changed. Those are all responses as a result of that sound.

The father, or maybe the mother, watching football or basketball hears a cry and may be annoyed that they have to get up right at the point in the game when they have to go check the baby. Those are all responses to a noise, a sound.

So sounds can create feelings in a person, emotion. Movies, for example, use sound tracks to stimulate certain responses in the viewers. They also can use sights as well as smells. So each of these produce a set of emotions that -- baking of bread, for example, or the cooking of an apple pie, these all stimulate a certain response. So I'm saying literature -- medicine tells us that annoyance is an emotional response to stimuli.

Now I always like this sign. That guy didn't last very long probably at the highway department, but it brings the point to the fact that we get annoyed every day at something. Somebody cuts us off, somebody's playing loud music. But the whole thing is the fact that, as my example with the baby crying, sometimes that creates a negative response and sometimes it creates a positive response in that individual.

Dr. Leventhall out of the UK is a senior

person in the science of sounds and response, and he has pointed this out in a number of his publications concerning the perception of noise and the emotional response.

So we've got the situation where annoyance or an emotional response is attributed to a particular impact, say, wind turbines for example, and about negative attitudes towards those. What we're seeing is a growing body of literature, peer-reviewed science literature indicating that there's definitely an association of annoyance with the response to various stimuli, whether they be roads, airplanes, airports or wind turbines. That body of knowledge is growing and we're being able to use it.

But I've got to go back and point out that this response to noise is normal. Doesn't feel good sometimes. Sometimes there's anxiety. Sometimes there's fear, happiness or even anger. But the point being these are normal responses and they're also conditioned responses.

So wind turbines annoy us. As Mr. Hankard pointed out, wind turbines have a noise associated with them. Everybody that's visited a wind farm

site has heard this. But the thing is that is part of our environment, and the fact that responding to that, that is a signal of what might be annoying to that individual.

Now let's put that sound in perspective. I talked about the sound in the room. We've heard about the sound of turbines at various points, and understand that's 1500 feet, it could be another sound level at 1250 feet, there could be sound right at the hub, but the point being that there's noise around us all the time in different frequencies.

And so this is another example like the thermometer that Mr. Hankard showed. For example, this just points out the importance of understanding that noise, sound, is around us all the time. It's something that we experience every day. And when we experience it, normally it's not a problem unless it's associated with a particular feeling or emotion.

Now, the Internet has brought out a lot of information. This evening, I Googled wind turbine health and I hit 5.6 million sites on the Internet. Now I didn't go through all of those, but you can imagine how much information is out there. And it's

very important to keep in mind that that's got to be evaluated carefully.

Now, there are some theories out there, some hypothesis about how wind noise and noise in general affects individuals. And these are interpretations. And sometimes they're misinterpretations. Sometimes they use information from guinea pigs to reflect on what humans might respond to. EPA does not use animal studies when there are human studies available for comparison. There have been situations where researchers have applied other types of information to the issues of wind turbine noise.

For example, the Schomer example that was used just a minute ago involving the Navy pilots, those were young recruits that they shook them intensely in order to produce that. Two other things. Work by Dr. Ingber involving mechanical transduction, that particular work has been applied, attempted to be applied to response to wind turbine noise, but, in fact, Dr. Ingber has said it does not apply. Same thing with Mulvihill's work in tensegrity, which again that has -- it's a great name, it's scary, that sort of thing, yet it does

not apply to wind turbines. It was applied in another particular area.

So the point is that really you've got to be careful when you look at material, whether it be on the Internet or in books or in the literature. I would point out, and I think it's something that we all need to consider, is the fact that information is not knowledge. What you see on the Internet is not peer-reviewed. It's not reviewed by anybody usually. It's somebody's idea. So it's very important to understand the source of the information used, and there's got to be some way to validate it, some way to give it some weight.

And the thing that we use as scientists is a thing called the peer review process. That is where a researcher goes out and does a study, submits it to a journal. That journal then submits it to a review board that's blinded to the author that has knowledge that can be applied to it, and there's a critical process where they're saying is this a good study, is this one that should be in that particular journal.

The thing is that various journals have different standards. So you might get it accepted

in one journal but not another. So it's very important to understand that not all journals are created equal.

The other thing is to understand that in the Internet or, for that matter, talking to individuals, they could be very persuasive, but you've got to guard against the use of volume instead of veracity. I'm always reminded talking to somebody that doesn't understand English, English is not their first language, we always tend to talk louder to them thinking that we're going to get them to understand us better. That's not the situation in that example or in science.

So let's look at it a little bit more carefully as far as the scientific method because what we're doing is we're looking at the peer-reviewed published literature concerning exposures to noise and specifically noise related to wind turbines. The scientific method is one where really science is trying to determine causation. There's a difference between association and causation. Again, those are misused and used interchangeably in the Internet, but really you have to be very careful about that.

We could look outside, let's say tonight in this example, and we saw out of the next ten cars that passed us, that five of them were yellow. Does that mean that 50 percent of the cars in Pontiac are yellow? No, that's just we have seen that it's associated with this particular building at this particular time. That's an observation.

Scientific method is that researchers make a series of observations, they publish it, that forms a body of knowledge that can be used then to determine about causation, but those scientific studies start with a hypothesis. I had a hypothesis. Five yellow cars out of the ten that went past the building were yellow. My hypothesis was that 50 percent of the cars that go past -- or that are in Pontiac are yellow. So we've got to test it. So everybody goes out and counts the color of cars. Then we begin to get a body of scientific knowledge and we put it together.

And that's what we're going to talk about next as far as wind turbines, is the fact that there is an effort in the literature to answer the question of whether or not there are health effects associated with wind turbines.

Now I talked a little bit about epidemiology and what I do, but here's the official definition. It's the study of the distribution of determinants of health-related states or events for a specific population. Epidemiology of the yellow cars, for example. It could be heart disease, it could be cancer, it could be any number of things, but that's what we study in epidemiology; specific techniques, specific study designs that are used.

Let's talk specifically about wind turbines because one of the things is, as an epidemiologist and as a physician, in order to look at the science, you really need to get into what you're looking at, what are the parameters of the exposure.

And wind turbine noise, there are two things that come up. One is the mechanical noise and one is the aerodynamic noise. Now, I'm saying this as a layperson here in this part because I'm not an expert in the sound measurements and that sort of thing, but I have to look at it in terms of what's in the literature. And as a scientist, I have to evaluate what sort of measures they use in order to evaluate exposure.

So one of the things that comes up in looking at the literature, that over time wind turbines have changed. They've gotten -- mechanical noises have been decreased. Aerodynamic noises have been decreased. The noise levels in general in the newer turbines are better or lower than they were in the older ones.

So again, as a scientist, as an epidemiologist, I've got to be careful as I look at the literature to make sure that that's not a compounding factor in evaluation of those studies.

So what I've done is gone in and pulled out the majority of the studies that had been used to evaluate the question that I was asked. It's very important to understand that there's -- this is a limited volume of literature, it has been evaluated by a number of different agencies, but this is the best data available.

So in addition -- these are really cross-sectional. They go in and they do a survey of individuals in, say, a wind farm and there is a range of credibility or value of these studies, but the point being that these have been used for the evaluation.

In addition, there's some very interesting studies that are done. Another way of looking at wind turbine noise is to expose people to it in a controlled manner. The lower three studies did just that. They went in and exposed individuals to recorded wind turbine sound noise and to a sham, but they didn't tell them what they were doing other than the fact that they were exposing them to a level of sound. But what they did is they also created expectations by showing them either a video or explaining to them about the study that was one of testing for the effects of wind turbines.

And what they found was that that suggestion was a very -- it was positively associated with their response to that sound. That's important in the fact that there was a controlled exposure to that sound and a -- so it's called a randomized controlled trial.

Some people were exposed to the wind turbine sound first. Some of them were exposed to the sham first. So it really is a very powerful method of testing for a response. This is used all the time in drug testing, for example. And so what we see here is this clearly indicates that a

person's perception of the exposure is very important. Again, that is a normal response that we have as humans.

Now there's been two recent reviews. I'm going to talk about a whole series of reviews that have been done, but it's important to point out that there's a growing body of literature out here indicating the magnitude of the studies and the fact that there is no adverse health effects being associated with wind turbines in the literature. But these are the international reviews.

So you've got the researchers in that list I showed you. Then you've got how that information is used. And today, governments and -- state, local, federal and national governmental organizations look at this literature and are trying to answer the very question that you are being posed with tonight, and that is about is there an effect of wind turbines on -- a health effect of wind turbines.

As you see, it's quite a varied group. These are all governmental organizations, they all use a panel, they use the peer-reviewed published literature, and they evaluate it much like I have.

This is -- I'm going to go through some of these in more detail. You've got copies of all of them, I believe, in the stack. But Health Canada just came out with one and this one is a little bit different in the fact that there was a review with it, but they also did some studies on their own. And again, they really pointed out what they came across with was the fact that annoyance is a very important part of what is driving the health concerns revolving around wind turbines.

It was very interesting that the Australian Medical Association again in 2014 came to a very similar conclusion. This is interesting in the fact that these are physicians in Australia. There's a lot of interest in wind turbines in Australia and certainly very active individuals that are against wind turbines.

It's very interesting that the Australian Medical Society came out with the point that there are not adverse health effects associated with wind turbines.

These are -- the states have even gotten into the evaluation of potential health effects. We see Minnesota, Vermont, Massachusetts. We'll hear

more about Massachusetts in just a minute, because one of the individuals involved with the Massachusetts study is actually going to address you.

But again, they're using the information, they're looking at it independently. We even have a panel here in Illinois that has looked at it. I was part of the Wisconsin effort. And they basically all talk about the annoyance. They all talk about the health concerns that are voiced. But again, they point to the fact that there's no consistent scientific evidence of an association.

So it's really, again, multiple people looking at it from multiple different directions and coming up with basically the same conclusion. And I think that that's very important as we look at not only the science they're using, but the process that they're using to come up with these opinions.

Minnesota was interesting in the fact that they're one of the first. And again, they come up with talking about the hypothesis of the vestibular stimulation system. And again, more information has come out since 2009. And that's the second part of my point here is the fact that not only do wind

turbines change over time, but also as these panels review the scientific information, they begin to get more information that they can use and strengthen the opinion and the science and use the strengthened science in making that opinion.

I talked a little bit about Massachusetts. Here we have Maine. Again, went through their review process independent of the other states. The panels are different. They use -- look at the information. They use a very similar process to go through it and to question the science. And they, too, came up with a very similar conclusion.

This is the one from Illinois. Again, this is 2012. So more information is available and they're coming up -- we're beginning to see a commonality of these panels of experts. They include physicians, they include acoustical specialists, some of them include community members, as well as industry representatives. So it's a mixed group. There's no uniform pattern to how these groups come together. But in the material I've provided you with, it gives you the details of how these panels come together and what information they've used.

Again, here's Oregon in 2013. It's in the pack. And again, they come to a very similar conclusion. There are some variations in what sound levels that they discuss and recommend. But again, the question is for this panel: Is there a health effect associated with wind turbines?

Wisconsin. Again, Wisconsin just came out with their latest report October 31st, 2014. So again this is evolving. But yet we see a trend now in all the review of the material that's available and each review panel come up with very, very similar conclusions when they review the material.

This is Tule. Again, they used information that I provided in 2009. And this also got into the issue of Dr. Pierpoint and the coining of the term "wind turbine syndrome," which is not a recognized medical condition. And it's very important, this has gotten a lot of media play, a lot of play on the Internet. And you -- it is not a disease, it's not a diagnostic criteria; it's merely one person's hypothesis.

Remember, I talked about doing an epidemiology study based on the hypothesis. Her hypothesis talks about the fact of low level

airborne infrasound and its effect on the vestibular system, which we mentioned prior to that, that's the balance system of the body.

The second one is about the effect of infrasound on internal organs, such as the diaphragm and the lungs. Again, these are hypotheses that she has proposed in a self-published book that was put out several years ago.

Let's look at those points more carefully. There's no credible science to base her initial hypothesis about the wind turbine sounds and the vestibular system. In fact, really when you look at it, that level of sound is lost in the background sound that our bodies produce, not just the sound from the outside. So it doesn't hold water.

Let's look at the second hypothesis. This is the one about the shaking of the diaphragm and that sort of thing, internal organs, based on her hypothesis related to low frequency sound. Again, the body has a number of sources of sound at this level, so why would external sounds affect the internal body when the internal body is making those same sort of sounds? It doesn't make sense. But this hypothesis has been put out there and it's one

that has to be considered.

So how do you do that? Well, you look at the various -- what's the study design? What did she do? She testifies that she has actually tested this. In fact, she did a case series of interviews and she talked to 34 subjects. She advertised on the Internet and that sort of thing to get these individuals to contact her, and they're from around the world, those 37.

But one of the things that she did in her book, she says a before and after study, that is where she asked them did they have the symptoms before the wind turbines came in or after. That is not an acceptable design to test that hypothesis. It's not an effective and accepted design to test anything.

So -- but the other thing is the fact the way she collected the information is also very important to look at. There was a selection bias. And you have to understand that, again, is a normal process. A person that feels that they're affected by any particular activity is more likely to report it.

Second one is information bias. Just how

is that information collected? It can be very much affected by the individual's perception of the exposure. And if that information is not collected from both affected individuals and non-affected individuals in the same manner, you will have information bias.

So really and truly when we look at it, Dr. Pierpoint's wind turbine syndrome has not been peer-reviewed in the scientific literature like the other studies that I've talked about. It just doesn't hold water medically. It's published in a book and I have a copy of it and I've read it, but it's a self-published book and it's -- the peer reviewers, one of them was her husband and then two friends.

So the point being that I'm concerned about the use of the words "wind turbine syndrome" because it actually directs an individual to think there is a condition when, in fact, there may be another condition affecting them, which we'll hear about a little bit later when Dr. Ellenbogen talks about independent medical evaluations.

Now the other thing is that we heard something about shadow flicker. And this is --

again, it's a real phenomenon. Anybody ever watch the old movie Casablanca? There's a scene in the restaurant where the light is above the fan and there's a flicker in the room. We've seen that at various activities. Strobe lights, for example, or mirrored balls in dance halls. But the point being that this is -- there's a subset of the population that are affected adversely by flashing lights, and it's about 5 percent of the population.

It's called photo-sensitive epilepsy, but the point is, and it goes back to, very similar to what I was talking about noise, the fact that there's certain frequencies that are associated with that. And as the United Kingdom Epilepsy Society addressed this because of concerns, and they're talking about there has to be a flashing speed of three flashes per second in order to trigger it. Well, we know that wind turbines -- normal wind turbines rotate at between .6 and 1 hertz, which does not meet that standard.

In fact, in the U.S., they talk about 10 hertz is more likely to cause epileptic seizures. And an example is the strobe lights used in light shows are around 3 hertz. So we don't see

photo-sensitive epilepsy in those situations, and we would not see it in wind turbine flicker either.

Now, what's going on? Why do we see this? Why the annoyance? Now, I talked about annoyance being a normal response. Sometimes it can be an abnormal response to a normal sound. But it's there, it's a condition. This is not new to medicine. We talk about the placebo effect. If you think a drug is going to help you, it has a better likelihood of reducing your symptom than if you don't think it does. That's called the placebo effect.

There's also called a nocebo effect. Didn't make it up; it's in the literature. And that is if you feel there's going to be an adverse effect from the drug, you're more likely to report that adverse effect, you're more likely to feel it. And this is very, very similar.

Remember when I was talking about those studies where they exposed the individuals to sham sound versus wind turbine sound and preconditioned them with information about wind turbines. You can affect the person's perception of a sensory input, whether it be smell, sound, or sight for that

matter. So it's not new. What we're seeing in the literature is not new, and it's something that the scientific literature, the peer-reviewed literature is addressing.

Is it addressing it as fast as everybody would like and have the definitive answer forever and ever? We're continuing to get information. But the information continues to indicate that there's no adverse health effect from wind turbine exposures.

So this is really the important thing. You look at these studies that have been done. They've been done in different countries, they've been done by different methods, different researchers. This information has been reviewed by international panels, by state panels. They each come out with a very similar conclusion. They're not identical conclusions, I never would say that, but what they do is they point out that overall there is an association between wind turbines and annoyance.

No question. People are irritated. Some people are irritated -- you saw that percentage that Mr. Hankard put up there concerning maybe 16

percent. I don't think it's 45 percent, I would agree, I think that's wrong, but I think that what we do see is in the peer-reviewed literature that there's clear indication of no direct effect of adverse health effects from exposure to wind turbines.

The epidemiology is there, the controlled study which I talked about, very interesting in the fact that they exposed individuals to wind turbine sound pre-recorded, but they had to get it reviewed, that study had to be reviewed. Normally we review all studies involving human subjects. That study had to be reviewed before they could do it and it was approved that they could expose these individuals to wind turbine sound for this study. So again, that gives us some indication of what the scientific feeling is for the noise associated with wind turbines.

So what I'm saying is the fact that the literature is clear. I've provided it to you. It's been looked at in a number of different fashions, and there is not a substantiated indication of increased risk of adverse health effects associated with wind turbines. Thank you.

CHAIRMAN CORNALE: Thank you, Mr. Roberts. One quick question just about your Power Point. Were Vermont and Massachusetts scientific review panel and findings, did you go through those and I just missed those? They were in our packet and I want to be sure.

MR. ROBERTS: Yes, I did.

CHAIRMAN CORNALE: You showed them up there?

MR. ROBERTS: I showed them up there. Vermont is up there.

CHAIRMAN CORNALE: Can you scroll us back to the slide? That way -- otherwise, we may have to amend this. Okay, very good.

MR. ROBERTS: All right?

CHAIRMAN CORNALE: We missed them. Thank you.

MR. ROBERTS: Not a problem.

MR. BLAZER: With that, Mr. Chairman, it's three large piles. They are Pleasant Ridge Exhibits 51 through 95 are the studies, reports and analyses that Dr. Roberts identified. 96 you already have, that's his presentation. And 97 is his c.v.

THE CHAIRMAN: All right.

MR. LUETKEHANS: Do you want -- do you want to note that 56 is not the full study?

MR. BLAZER: Oh, that's right, thank you, counsel. Our Exhibit 56, just for the record, is an excerpt from the Tule wind environmental impact statement, environmental impact report. The total report is 7,204 pages long. The excerpt is approximately 300 pages long. It's that excerpt that is our Exhibit 56. We've made the entire report available digitally. Excuse me, Mr. Luetkehans has one. Mr. Blakeman has one. Mr. Griffin has one. I think I gave one to --

CHAIRMAN CORNALE: It's my understanding that that will be available --

MR. BLAZER: Mr. Schopp has one.

CHAIRMAN CORNALE: -- on the County website.

MR. BLAZER: The full-sized one.

CHAIRMAN CORNALE: Yes.

MR. BLAZER: It's roughly 400 megs, but if you want it, that's fine. Just so it's clear, 56 is an excerpt from that full report.

CHAIRMAN CORNALE: All right, I'll go through these real quick for the record. We can

make this available to the court reporter, too, this sheet, so that if you miss something.

Okay. Pleasant Ridge Exhibit 51, Minnesota Department of Health 2009. Pleasant Ridge Exhibit 52, Vermont Department of Health 2010. Pleasant Ridge Exhibit 53, UK Health Protection Agency 2010. Pleasant Ridge Exhibit 54, Ontario Chief Medical Officer of Health 2010. Pleasant Ridge Exhibit 55, KFL&A Public Health 2011. Pleasant Ridge Exhibit 56, the Tule EIR/EIS, excerpt only, 2011. Pleasant Ridge Exhibit 57 is a Springfield/Sangamon County Regional Planning Commission 2012. Pleasant Ridge Exhibit 58 is a Maine Department of Health and Human Services 2012. Pleasant Ridge Exhibit 59 is the Massachusetts Department of Public -- Department of Environmental Protection 2012.

Pleasant Ridge Exhibit 60 is the Oregon Health Authority, Public Health Division, 2013. Pleasant Ridge Exhibit 61 is Scotland 2013. Pleasant Ridge Exhibit 62 is the Australian Medical Society 2014. Pleasant Ridge Exhibit 63 is the Health Canada Study Summary. 64 is Wisconsin Wind Siting Council 2014. Pleasant Ridge Exhibit 65 is

the Bakker et al. 2012. Pleasant Ridge Exhibit 66 is Chapman 2013. Pleasant Ridge Exhibit 67 is the Crichton et al. 2013. Pleasant Ridge Exhibit 68 is the Crichton et al. 2014. Pleasant Ridge Exhibit 69 is the Fiz 2008.

Pleasant Ridge Exhibit 70 is the Ingber-Progress in Biophysics and Molecular Biology in 2008. Pleasant Ridge Exhibit 71 is the Ingber 2003. Pleasant Ridge Exhibit 72 is the Ingber 2008. Pleasant Ridge Exhibit 73 is the Janssen et al. 2011. Pleasant Ridge Exhibit 74 is Knopper et al. 2014. Pleasant Ridge Exhibit 75 is Leventhall, A Reviewed Published Research on LFN. Pleasant Ridge Exhibit 76 is the Maffei et al. 2013. Pleasant Ridge Exhibit 77 is McCunney et al. 2014. Pleasant Ridge Exhibit 78 is the Mroczek et al. 2012. Pleasant Ridge Exhibit 79 is the Nissenbaum et al. 2012.

Pleasant Ridge 80 is the Pedersen and Larsman 2008. Pleasant Ridge Exhibit 81 is the Pederson and Waye 2004. Pleasant Ridge Exhibit 82 is the Pedersen and Way 2007. Pleasant Ridge Exhibit 83 is the Pedersen and Waye 2008. Pleasant Ridge Exhibit 84 is the Pedersen et al. 2009.

Pleasant Ridge Exhibit 85 is the Pedersen 2011. Pleasant Ridge Exhibit 86 is the Pedersen 2010. Pleasant Ridge Exhibit 87 is Protect Our Communities Foundation versus Jewell-Tule Wind. Pleasant Ridge Exhibit 88 is the Roberts Roberts 2013. Pleasant Ridge Exhibit 89 is the Sakai 1971.

Pleasant Ridge Exhibit 90 is the Shepherd 2011. Pleasant Ridge Exhibit 91 is the Taylor et al. 2013. Pleasant Ridge Exhibit 92 is the Wisconsin PSC testimony, Dr. Leventhall, 2009. Pleasant Ridge Exhibit 93 is the Witthoft and Rubin 2013. Pleasant Ridge Exhibit 94 is the Wolsink 1993. Pleasant Ridge Exhibit 95 is the Wolsink 2000.

And 96 and 97. 96 has already been accepted. And 97 is the Roberts curriculum vitae. And that's all of them. And 99 has been skipped.

All right. And those will all be accepted and they are available if the public would like to look at them.

With that, Mr. Blazer.

MR. BLAZER: That is it. That's not it. We're going to do something a little bit different with the next witness, Mr. Chairman. The next

witness is Dr. Ellenbogen, and we're going to present him in a question and answer fashion. We'll not be doing a presentation with him.

CHAIRMAN CORNALE: All right. He doesn't have -- he has no formal presentation?

MR. BLAZER: We didn't do a Power Point with him, no.

CHAIRMAN CORNALE: Okay.

MR. BLAZER: It will be --

CHAIRMAN CORNALE: As the audience inquires, he may opt to answer the questions at-hand. Is that --

MR. BLAZER: No, I will be conducting a direct examination of Dr. Ellenbogen. It's not a Power Point presentation. It's --

CHAIRMAN CORNALE: Understood, okay.

MR. BLAZER: Okay. I was going to suggest maybe the best thing to do is since I'll ask the questions from here, maybe slide the podium around over there so he can both hear me and talk to you. Is that --

CHAIRMAN CORNALE: Very good, whatever you feel will work the best.

MR. ELLENBOGEN: Hope this bottle of water

is mine.

EXAMINATION OF DR. JEFFREY ELLENBOGEN

BY MR. BLAZER:

Q. Would you state your name, please, sir?

A. Jeffrey Ellenbogen.

Q. Could you describe your educational background, please?

A. Sure. I'm a medical physician. I did a bachelor's at University of Michigan, medical degree at Tufts University in Boston, and master's in medical science at Harvard Medical School.

Q. What is a master's of medical science?

A. Master's of medical science is basically extra education meant to train people to take scientific information and translate it into applied medical sciences so that it can be useful to doctors that see people.

Q. Do you have your statement of qualifications or c.v. in front of you, Pleasant Ridge Exhibit 101?

A. Yes, I do.

Q. And is that a current and accurate statement of your educational and professional history and qualifications?

A. Yes, it is.
Q. Do you specialize in a particular field of medicine?
A. I specialize in two fields. The first is neurology which is a discipline focused on disorders of the brain and neurological system. And the second specialty is sleep medicine, where people have concerns about the medical problems that they might encounter with their sleep.
Q. And do you also -- do you also do clinical work?
A. Could you repeat that?
Q. Do you do clinical work?
A. Yes, I do. I see patients at Johns-Hopkins Hospital in Baltimore, Maryland, where I see a potpourri of problems, including outpatient clinical neurology, mostly focused on issues relating to sleep disorders. And occasionally I do inpatient neurology which involves medical emergencies and neurological diseases, things like meningitis and head trauma and motor vehicle accidents.
Q. Do you hold any professional licenses?
A. I hold a license to practice medicine in

the state of Maryland.

Q. How long have you been a practicing physician?

A. I finished my medical doctorate in 2000, got my medical license in 2001, and have been a practicing attending for the past eight years.

Q. In the course of your work, have you had the opportunity to study the issue of alleged health impacts from wind turbines?

A. Yes, I have.

Q. And could you describe how your experience in that area began?

A. Sure. I was approached by the Massachusetts Department of Environmental Protection and the Massachusetts Department of Public Health. The commissioners from both of these government agencies asked me to join a group of people to evaluate the potential health risk of wind turbines on humans. And that was in -- I'm sorry I didn't mention that. They approached me in 2011.

Q. And was a study -- was a study conducted as a result of that request of you?

A. Yeah, that's exactly right. The commissioners asked us -- they charged us to bring

together a group of people who could perform an independent evaluation of the scientific and medical literature. And also we were charged to extend the breadth of that reach by soliciting information from the public in order to hear any potential complaints that might not have trickled into the medical literature but were areas of potential concern.

The commissioner was very concerned that we were -- not only address existing scientific knowledge, but also make absolutely sure that we were not leaving stones unturned with respect to even potential plausible medical problems that might be a consequence of wind turbines.

Q. And is Pleasant Ridge Exhibit 59, which is identified as Massachusetts Department of Environmental Protection 2012, the results of that effort?

A. Just double-check. Pleasant Ridge Exhibit 59?

Q. Yes.

A. Yes, it is.

Q. All right. How many people were on the panel that was commissioned by the Department of Environmental Protection and the Department of

Public Health?

A. This was a group of seven people.

Q. Could you identify them, please?

A. Sure. There was myself. There was also Dr. Sheryl Grace, who is a mechanical engineer at Boston University. Dr. Wendy Heiger-Bernays, she is an environmental health expert at Boston University as well. Then there was Dr. Jim Manwell. He is a biophysicist who focuses on wind turbines and engineering. Dr. Dora Anne Mills, she is a person that had extensive experience as a state health officer in Maine. She also has a public health degree.

And two more folks real quick. There was Kim Sullivan. Dr. Sullivan worked at Boston University in the Department of Environmental Health. And then finally, but not least, Marc Weisskopf, who was a neuroscientist and epidemiologist.

Q. What was the general conclusion of the study?

A. The general conclusion, the big picture, is that wind turbines do not pose a risk to human health.

MR. LUETKEHANS: Mr. Blazer, could we take about a 30-second break so I can actually get the study since it's all sitting in front of us please?

MR. BLAZER: Oh, sure. And I neglected to do that. I apologize, these are your stacks. It's going to take a little more than 30 seconds. Do you want them all right now or do you want to --

CHAIRMAN CORNALE: Do you guys just want 59? Just 59. Is he going to reference anything else?

MR. BLAZER: No.

CHAIRMAN CORNALE: Okay.

(Brief pause.)

MR. BLAZER: Everyone has one, Mr. Cornale.

CHAIRMAN CORNALE: Yeah, we have one or everybody has one.

BY MR. BLAZER:

Q. All right, I'd like to go through with you, Dr. Ellenbogen, some of the specific findings of the study. It's lengthy. We're not going to go through the whole thing.

First page, ES -- excuse me, the section is entitled ES 4.1A, Production of Noise and

Vibration By Wind Turbines.

A. Uh-huh.

Q. I'd like to focus on finding number two, page ES-5. And for the ZBA, these are all -- I'm going to be going through the findings in the executive summaries so we don't have to dig all the way through the 100 and some odd pages of this report. Those conclusions are repeated throughout the report.

All right. The first finding, number two, that I'd like to ask you about, Doctor, typically at distances larger than 400 meters, sound pressure levels for modern wind turbines are less than 40 dB(A), which is below the level associated with annoyance and the epidemiological studies reviewed. Could you explain what that means?

A. In plain English, that means that at approximately 1300 feet, the existing literature did not demonstrate sound pressure levels that were really above a whisper and would not expect that to lead to substantial annoyance.

Q. Finding number three on the same page, infrasound refers to vibrations with frequencies below 20 hertz. Infrasound and amplitudes over 100

to 110 dB can be heard and felt. Research has shown that vibrations below these amplitudes are not felt. The highest infrasound levels that have been measured near turbines and reported in the literature near turbines are under 90 dB at 5 hertz and lower at higher frequencies for locations as close as a hundred meters.

Could you explain what that means and how your panel came to that conclusion?

A. Yeah. Again, coming back to the same process of evaluating existing scientific literature, I think that actually Hankard spoke to that very nicely. This is infrasound. This is sounds beneath the level of human hearing. And the turbines that exist that have been published and described out there in information are well beneath the levels we would expect people to actually feel those vibrations.

And I think the analogy from a piano is really apt. Imagine if a piano, if you went even lower frequencies from high to low and then the piano -- imagine the piano had even more keys beyond which you could even hear so low. And then imagine tapping that extremely softly, gently, so that we

would expect that not only would you not hear infrasound, which is the defined feature of that band width, but also that one would not feel that pressure wave.

Q. Finding number four, same page. Infrasound from wind turbines is not related to, nor does it cause a continuous whooshing. Could you explain what that means and how your panel came to that conclusion?

A. Right. This was an important one because it wasn't as much in the scientific literature as in the population of people that were near wind turbines were describing. And they use various vernacular to describe. The common one they came up with was a whooshing sound, said we were hearing whooshing sounds.

Looking at the literature, hearing people's complaints, thinking about it and talking to acousticians and having our panel, we recognize that whooshing is an audible signature that are within the band waves that are well into the audible range. So the only main point that we're making here is infrasound, meaning the sounds that we don't hear, are not the thing that causes what people

describe as a whooshing. A whooshing is from different kinds of sounds, the sounds that are well within the range that we normally hear.

Q. I'd like to go to the next section now, ES 4.1.B, Health Impacts of Noise and Vibration. Finding number one on page ES-5, most epidemiologic literature on human response to wind turbines relates to self-reported annoyance. And this response appears to be a function of some combination of the sound itself, the site of the turbine, and attitude towards the wind turbine project.

Could you explain that finding and how your panel came to that conclusion?

A. Wow, that was just a mouthful to simply say that different people get annoyed at different things and there's lots of things that contribute to that. But really, annoyance with respect to a wind turbine is a very personal issue that brings a lot of psychological background to that and has a diverse set of causes depending on the person.

Q. Was that finding, in part, the result of the individual interviews that you say you conducted?

A. That finding was part of the solicitation -- I didn't interview people just to clarify the process. It was we had a comprehensive review of the scientific literature and we solicited input from folks who would literally submit things by email or mail. We later had town meetings that supported this notion. So it was not through interview per se, but through a solicitation of information, yes.

Q. The next finding, number 5, that's page ES-6. There is insufficient evidence that the noise from wind turbines is directly, i.e., independent, from an effect on annoyance or sleep causing health problems or disease.

A. Yeah, we recognize --

Q. Go ahead.

A. Seems to be the same question on every one of these. We recognize that for some people wind turbines annoy them, be it the sound, the sight, the very presence, complex notions of economics, but -- and that annoyance can lead through downstream effects to physiological effects, but that there were no direct physiological effects on health in humans from wind turbines.

Q. All right. Let's go to finding six on the same page, ES-6. Claims that infrasound from wind turbines directly impacts the vestibular system have not been demonstrated scientifically. Available evidence shows that the infrasound levels near wind turbines cannot impact the vestibular systems.

Now Dr. Roberts also mentioned the vestibular system. So first, could you explain what that is?

A. Absolutely. And this was something that came up quite a bit among our staff of folks that had registered concern or things that they had heard about, not necessarily that they experienced themselves, many things came up, including the term vestibular came up a lot. So I wanted to take a moment to explain that.

I'm a neurologist, so I can't help thinking about the world through a neurological lens. But we talk about the five senses, I won't bore you with the details, but we have many more than five senses: temperature, vibration, proprioception, position sense. And one of them is the vestibular system which is responsible ultimately for deciding our position in the world.

Yaw, pitch and roll for pilots in the audience.

And the vestibular system is a physical system. A physical system has fluids, neurons, hair cells. And there was concern among people that this dynamical system that's responsible for helping me figure out where I am in space could be affected by the vibrations produced by a wind turbine.

And we did not -- so we took that concern very seriously. We did not find evidence in the human or animal literature to support that vibrations of the kind produced by a wind turbine could influence the vestibular system. And we spent a lot of time thinking about, okay, there's nothing reported, but does that make biological -- biologically plausible sense, meaning sort of that next threshold doesn't exist in the medical literature, but maybe it makes sense and maybe this is something that hasn't been discovered yet.

So we debated that quite a bit, looked at animal models, discussed theory and came to the conclusion based on all of that in our deliberations that wind turbines do not influence the vestibular system, which is to say they don't cause problems with balance and position sense.

Q. Finding seven on page ES-7, there is no evidence for a set of health effects from exposure to wind turbines that could be characterized as a, quote-unquote, wind turbine syndrome. What did your panel do to reach that conclusion?

A. Well, the first thing that we all did was read the book "Wind Turbine Syndrome" by Pierpoint. And we discussed the notion of -- the idea of what a syndrome is. Remember, a syndrome is a medical term. It means a constellation, a repeated constellation of symptoms that many people experience accompanied with a disease.

And so we looked at the full potpourri of what was described in this phenomena called wind turbine syndrome, looked at the scientific literature, the medical literature, discussed biological plausibility, deliberated it, listened to individual concerns from people in the Commonwealth of Massachusetts, and came to the conclusion that based on the available scientific and medical literature and our existing knowledge, that there is no such thing as wind turbine syndrome.

Q. Finding eight, still on page ES-7, the weight of the evidence suggests no association

between noise from wind turbines and measures of psychological distress or mental health problems. How was that conclusion arrived at?

A. All through the same process. But I just want to clarify that piece. We did acknowledge and do acknowledge that wind turbines for some people can cause annoyance. What we were referring to in this piece was the concern that it would cause depression, anxiety, medical and psychiatric illnesses of a clinical magnitude.

And again, looking through that same area of process -- you're all probably bored of hearing me say it -- but medical literature, scientific literature, hearing complaints, deliberating, thinking about plausibility, we did not find any evidence to support the idea that wind turbines cause mental illness.

Q. Finding number nine, page ES-7 still. None of the limited epidemiological evidence reviewed suggests an association between noise from wind turbines and pain and stiffness, diabetes, high blood pressure, tinnitus, hearing impairment, cardiovascular disease and headache/migraine.

First of all, could you tell us where that

list came from?

A. That list was sort of this massive compiled -- not just using wind turbine syndrome, but really just anything that people would submit, we took every concern seriously. That was the charge by the commissioner was to leave no stone unturned.

So if someone said I have joint pain from these wind turbines that are nearby, we looked at joint pain. And if they said they had hypertension, cardiac disease, headaches, whatever it was, we looked at all of them. And you can imagine that this was a fairly tedious effort.

I mean I think -- I don't mean in a negative way, but it's a lot to disprove. Many, many negatives. But we took them seriously because these are serious medical illnesses that were raised as a potential concern.

And I just want to be clear. Compiling that list was not a list of all the ailments that people necessarily had. It was in many ways what people had heard might be caused by wind turbines and raised the potential for concern. So even if it was just simply the raising of a potential concern,

that was enough to make it to the radar for us to consider.

Q. One aside at this point, Doctor. When your panel was charged to conduct this study by the Department of Environmental Protection and Department of Public Health, were you directed to arrive at a particular conclusion?

A. Absolutely not. And in fact -- blanking on the commissioner's name now -- it was a couple years ago, but he was an unusual person in that he said if there's a problem, I want to know about it. Massachusetts is gearing up for a lot of wind turbines and I don't want to know about the problem after they're all over the state, so please look into this. Maintain your independence. You will not see me again until the report is published. But I just want to be clear, I want to know what you think and I want to know what's out there. And so he was a great person to work with and I appreciated that freedom and flexibility.

Q. Going back to this list of potential symptoms that people have provided to you and that they felt were associated with wind turbines, what do you take from that as a treating physician?

A. As a treating physician -- you know, look, I think it's really important to be able to address problems that people have, and I think it's as important to address problems that people are concerned they might have or that they have and that are concerned or caused by something because --

And one of the things I'd like to talk about, I hope we get into, this is a question and answer session, so I want to follow your lead, but one of the really key things here is, and this is true for all of medicine, does the patient -- it could be me as a patient or a patient that comes to see me, do they have a complaint and a concern that they ascribe causality to that concern to such a degree that that's the only thing that's focused on?

And my goal here and my take-home point, it's really important to allow for the possibility that wind turbines were causing medical problems. I think we looked at that. I felt very clear that they weren't. But I think I'm glad we spent the time looking at those.

At the same time, I want to -- it's really important to me as a practicing physician to see people open to the possibility of what the actual

cause of their problems are so that those medical problems can be adequately addressed and treated. And I think if there's an unusual overemphasis on one particular cause, that can be an incredible disservice to a person who's trying to pursue an understanding of their disease, get to a diagnosis, and get to a real treatment strategy if the focus is diverted elsewhere.

Q. Let's go to the next section, ES 4.2.B, Health Effects of Shadow Flicker. Finding one, page ES-7, scientific evidence suggests that shadow flicker does not pose a risk for eliciting seizure as a result of phobic stimulation. Can you explain that?

A. This is an important one. It was mentioned by Dr. Roberts, but it may be worth taking a few seconds to explain in a little bit more detail from the perspective as a neurologist. I treat seizures. Of the many seizures that people have, when they have repeated seizures and you don't know why, there's no cause, that's called epilepsy, unprovoked seizures.

But a little bit of a subset, a very small portion of people that have seizures, now this is

not a small portion of the total population, it's a small portion of the small portion of people that have seizures, they will have seizures that are provoked by little flickers of light, stimulation, lack of stimulation, stimulation, lack of stimulation, bam-bam-bam, and flashes of light.

And if they have this special kind, usually generalized seizures that start as a kid, if that small group of people are exposed to flashes of light, they can actually have a seizure. And so we spent a long time on it, and this is one of the areas that I focused on myself in this panel was thinking about shadow flicker and the concern that that might actually cause seizures because that would be a real problem.

And especially for houses that were cast in the shadow of the turbines, if the sun is going to hit at a particular point on the horizon and the blade is going to be spinning and the sun is going to kind of pierce through it, and periodically as one of those blades come across, it's going to cast a shadow onto the house and onto an existing person. If that turbine got whipping around and hit a certain frequency, could that cause a seizure in a

kid, adult, anyone that had epilepsy?

Okay. What's known fortunately about photic stimulated epilepsy or the small portion of people that have epilepsy that will get seizures as a result of flashes of light is that those happen as a result of frequencies at about 10, 15, 20 hertz, usually on the higher range or even higher than that is what will actually cause a seizure, and actually we use this clinically.

So people come into a lab and say I think I might have epilepsy, and we'll bring them into the lab in a controlled condition and we'll bring a strobe light in and say, okay, we're looking for brain waves. No seizures? Fine. Hit them with flashes of light to see if we can cause a seizure to make a diagnosis, and the flashes of light that we're using are on order of magnitude 15, 20, 25 hertz or faster.

The frequency of -- because of the nature of the speed and size of these turbines, the frequency of the flashing will be about half a hertz or one hertz, which is well below the range that would elicit a seizure even in someone who was vulnerable to photic stimulation seizures, so I feel

really comfortable that shadow flicker does not cause seizures. Now it certainly may cause annoyance, but that's not what we're talking about. From a point of view of seizures, shadow flicker does not cause seizures of any kind.

Q. Now, in two or three instances that we haven't discussed, Doctor, the study concluded that there was insufficient evidence regarding some issues rather than evidence of absence, which is what you've been talking about. Has there been any further information generated since that study in 2012 was issued that resolves those doubts?

A. Yeah. Actually just a few weeks ago there was the Health Canada report that came out. Now keep in mind this is a preliminary read of their data, it hasn't yet been peer-reviewed, so I'm eager to see it go through the proper channels, and we're asking ourselves to have that threshold for all of our data including this, but the Health Canada data is out, a brief summary a couple weeks ago, and will be reviewed and forthcoming I guess in the coming months.

In that study they looked not only at a medical literature review, which is a study but it's

not really a study, it's really an examination of existing knowledge, where this Health Canada study, they actually did physiology, measuring sleep, cortisol levels, sound pressure levels of wind turbines, and this is in Canada, hence the Health Canada label. And they did not show relationship between sleep problems and noise from wind turbines.

So I'm looking forward to that being a full throttle peer-reviewed piece of data, but it does help to convince me further that wind turbines do not cause health effects in humans.

Q. I'd like to go back to finding number 7 from the Massachusetts study, page 8 of 7. There is no evidence for a set of health effects from exposure to wind turbines that could be characterized as a wind turbine syndrome.

Now, Dr. Ellenbogen, since that study was published, have you personally had the opportunity to test the conclusions reached by that study including that so-called wind turbine syndrome does not, in fact, exist?

A. Yes, I have.

Q. Could you explain that please?

A. Yeah, even though I made my position

clear, and maybe I should just repeat it, from a medical and scientific point of view, wind turbine syndrome does not exist. Despite that, many people feel that it does and I acknowledge that. Many people in the population feel that it does, and as a result, there are people who have raised concerns, people living near wind turbines, that say I have wind turbine syndrome or a variant of it.

There was a population, is a population of people in Michigan who had raised such a concern, and I had the opportunity to go out and interview them. I was able to not only interview this small group of people, but I performed an independent medical examination of them. So while it was not -- a patient/doctor relationship was not built, but it was as if they were seeing me in clinic. We did a full history, full examination, I also had the opportunity to look at the physical location where they live, I also -- not inside their house, in the neighborhood, seeing the turbines themselves, and I had the opportunity to interview their spouse as well.

Q. And could you describe what you found in the course of those independent medical exams?

A. What was common to all of them, now this is a very small sample, it's only four people, those were the only people that I was allowed to have access to, all four of these people raised concern for having some sort of wind turbine syndrome-like problem.

And what I would like to do, I know it's getting kind of late, but just take a couple of minutes and show you why this has become kind of a soapbox for me in terms of how to think about relating to a person who has such a complaint.

These are four people that live near wind turbines in Michigan, I don't know the exact distance that they were, but they had raised concern for their medical health and well-being. And so I went to talk with them and interview them and examine them, talk to their spouse. And I just want to give a couple of examples of what I ran into.

The first is a 53-year-old industrial designer who complained, who raised a concern, excuse me, of insomnia and of palpitations in their chest, boom boom boom, at night and was absolutely convinced that the wind turbine near his house was causing the medical -- or these two problems.

And I won't bore you with all the details, but suffice to say, in talking with him in great detail, he had in recent years gained a lot of weight, snoring, witness apnea, meaning his wife had seen him gasp and stop breathing in the middle of the night. This gentleman absolutely had obstructive sleep apnea, so he was using the expression insomnia in the vernacular sense, insomnia, disrupted sleep, he would wake up periodically throughout the night, but he didn't have insomnia the way a doctor who studies sleep and treats with sleep medicine would deal with insomnia. He had disrupted sleep almost certainly from obstructive sleep apnea.

And obstructive sleep apnea. While he had spent six months, a year, thinking about how to sell his house, stressing about that, dealing with lawyers and the courts and litigation and mediation, and I don't even know the legal terms for all the discussions that people have, he was missing an opportunity to get a solid diagnosis and a treat -- a treatable condition, a condition that puts him at risk for stroke, heart attack, sudden death. So he was wasting a lot of time and energy in my opinion,

you know, going in one very particular direction.

Now it's perfectly reasonable for him to have had that theory, but that theory in his mind was crystal-clear, and it did, in my opinion, a big disservice for him. As a follow-up by the way, I mentioned the racing heart, he did end up seeing a doctor who did measure, I think it was a 24 hour or 48 hour electrocardiogram, that showed abnormal heart rhythm that did not relate to the wind turbine. So I'm hoping that he was getting treatment for something also unrelated to the wind turbine.

I should add, by the way, that I interviewed people, examined them, have spoken to their spouse, went to their neighborhood, but I also reviewed all of their medical history as well. So that was the first. And I know the hour is late, but let me just give a couple more examples because I think they're very instructive.

The next is a 45-year-old high school teacher, and she said I have a constellation of symptoms not unlike wind turbine syndrome, perhaps that very thing, headaches, sleepiness, anxiety, forgetfulness, poor mood, and it's all because of

the wind turbine just down the street. When I spoke with her at length, examined her, and I could feel on her exam, from her headaches, I mean she had real pain, discomfort where the mandible meets the skull, sometimes called the temporomandibular joint. She had very classic symptoms of TMJ. She did get some relief from a mouth guard, so that was great.

The sleepiness, anxiety and forgetfulness, we had talked together a lot and discovered in that time period the major change she did was she took a new job and was now waking up at 4:30 in the morning for a long commute, hadn't changed her sleep time and so was profoundly in sleep deficiency, which is well-documented to cause forgetfulness, sleepiness and irritability.

And finally for her mood, we talked a lot about her life. And my board certification as a neurologist is from the American Board of Psychiatry and Neurology, and so we talked about her mood in great detail, and she became instantly tearful when we hit her children who had just moved out to college and she felt a deep sense of loss to her -- what some people call empty nest syndrome or the fact that she was somewhat estranged from her kids

who went off to college.

And so I think she had probably a mood disorder provoked by life circumstances, I think she had a job that caused her to be sleep deprived, I think she had temporomandibular joint problems leading to TMJ-related headaches, and though I don't know those to be the absolute causes, I think those are the most likely based on my medical evaluation.

And I can tell you that she wasn't pursuing them in a meaningful way and she wasn't getting treatment for any of them. She had in her mind, implanted in her mind, I don't know whether she picked it up through the Internet or talking with folks or for whatever reason, that the wind turbine had caused those symptoms, and I think that was unfair to her.

Two more quick examples and then I'll have mercy on you. The next is a 52-year-old bookkeeper who had headaches, and so I measured her blood pressure and it's through the roof. I mean when you have high blood pressure, the pulse is going to transmit that pressure into the skull. People with that high of blood pressure that's untreated get headaches. I'm not saying that was the cause of her

headaches, but I think that that's a good culprit. I think it's untreated. I think she's spending a lot of time thinking about the cause of that being the wind turbine syndrome. Again, I think unfair to not allow her to have a full throttle of treatment that would be available to her if she saw a doctor that day.

And then the last one is a farmer, a 60-year-old farmer who had balance problems, and he was absolutely convinced the balance problems were from the turbine. He was around the turbine all the time. When he was around it and it was really noisy, he would lose his balance. And when I examined him, he had a serious neuropathy, which is a problem of the nerves to his feet. He could not feel his feet. When I asked him to walk, to do a tandem walk, which is just going one foot in front of the other, he was like he was intoxicated.

And he had three main problems. One, he had a neuropathy which is often treatable. It could be a vitamin deficiency. It could be another kind of a disease totally undiagnosed. The other is that he had a very severe alcohol problem which is not being addressed that can cause cerebellar

degeneration, problems in the back of the brain that's responsible for balance. And the last thing was that he was given a medication decades ago that he forgot about how to dose correctly. He hadn't been seeing anybody about it. He's one of those folks, like my father, who doesn't go to doctors very much and had just been taking the medication not realizing it was a drug that can cause fairly substantial balance problems.

So as, in my opinion, his nerves in his feet were backing out, his alcohol problem was getting more severe, and he was still taking that medication that when he was younger he could handle the balance problems but now was really catching up to him, all of those things are addressable medically, none of them were being addressed.

And I'm not saying that if it wasn't the wind turbine syndrome that he would have been a guy to go to a doctor, maybe he just never would anyway, but he had clear in his mind a constellation of symptoms caused by wind turbines. As a consequence, in my opinion that created a huge disservice to him. And I think that's true for all four of these people. And I bet that if I had the opportunity to

interview more of these folks we would just uncover much more of this.

For me, this is a reasonably passionate issue. I'm not saying wind turbines don't annoy people, if it was in my backyard maybe it would annoy me, but I think to stretch it out to say that it's going to cause a whole host of medical problems, to make up a syndrome that is unrecognized and unsubstantiated, that causes people to unduly emphasize that problem and not pursue other causes, is a big problem to me and it's an issue for individuals and the public.

Q. Thank you very much, Doctor.

MR. BLAZER: What I have, Mr. Cornale, an unusual witness, I have only one exhibit and that's his c.v. It's Pleasant Ridge 101.

CHAIRMAN CORNALE: All right, we'll except Pleasant Ridge Exhibit 101 as the Ellenbogen c.v. I would like to note for the record that 98, Pleasant Ridge Exhibit 98, 99 and 100 do not exist. There are no 98, 99 and 100.

MR. LUETKEHANS: Mr. Cornale, there is a 100. It's under Hankard.

MR. BLAZER: Some of these aren't in

order. 100 is Hankard right there.

CHAIRMAN CORNALE: All right, strike that.

MR. BLAZER: And 98 -- 99 is skipped. 98 does exist also.

MR. LUETKEHANS: And 98 is in the papers.

MR. BLAZER: Yeah. Yeah, under 26. That one's already there.

CHAIRMAN CORNALE: All right, got it. So strike all my comments on the record. And 99 for sure is skipped, but 98 and 100 do exist.

MR. BLAZER: Mr. Cornale, the only other question, maybe I missed it, Ms. Blank Exhibit 42, 3 and 4, did those go in?

MR. LUETKEHANS: Yeah.

MR. BLAZER: They did? Okay. Sounds like that's all we have this evening, sir.

CHAIRMAN CORNALE: All right. With that --

MR. BLAZER: Oh, here.

CHAIRMAN CORNALE: With that, we're looking at tomorrow evening, 7:00 p.m. start time, back here. Mr. Blazer, can you just fill us in on what we have to expect as far as looks like you have --

MR. BLAZER: Two more witnesses.
CHAIRMAN CORNALE: Two more witnesses.
MR. BLAZER: Birds, bats and other wildlife, and then economics and we'll be done.
CHAIRMAN CORNALE: Okay, so is that realistically --
MR. BLAZER: An hour.
CHAIRMAN CORNALE: About an hour. So about half the night give or take.
MR. BLAZER: I'm guessing.
CHAIRMAN CORNALE: So we'll start questioning after that.
MR. BLAZER: Sure.
CHAIRMAN CORNALE: All right.
MR. BLAZER: For the record, the only folks I won't have here tomorrow are Dr. Roberts and Mr. MaRous, but I believe they will both be available next Monday.
CHAIRMAN CORNALE: Okay. All right. So tomorrow evening, 7:00. For those that weren't here last night, we do have another meeting scheduled Monday the 24th at 6:30 and the location is in Fairbury at the Walton Center, 100 West Locust Street, and that's as far as we've looked at

scheduling wise.

So, Mr. Blakeman, do you have anything to add.

MR. BLAKEMAN: Not at this time.

CHAIRMAN CORNALE: With that, we need a motion to recess. John Vitzthum motions, Joan Huisman. All in favor?

ALL MEMBERS: Aye.

CHAIRMAN CORNALE: Opposed?

AUDIENCE VOICE: Aye.

(Adjourned at 9:08 p.m.)

STATE OF ILLINOIS)
)SS
County OF FORD)

I, June Haeme, a Notary Public in and for the County of Ford, State of Illinois, do hereby certify that the following Livingston County Zoning Board of Appeals, Case SU-7-14 hearing was taken at the Pontiac Township High School, 1100 Indiana Avenue, Pontiac, Illinois, on November 18, 2014.

That the said deposition was taken down in stenograph notes and afterwards reduced to typewriting under my instruction and that the deposition is a true record of the testimony given.

I do further certify that I am a disinterested person in this cause of action; that I am not a relative, or otherwise interested in the event of this action, and am not in the employ of the attorneys for either party.

IN WITNESS WHEREOF, I have hereunto set my hand and affixed my notarial seal this 24th day of November, 2014.

JUNE HAEME, CSR
NOTARY PUBLIC

"OFFICIAL SEAL"
June Haeme
Notary Public, State of Illinois
My Commission Expires:
September 27, 2016

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