BEFORE THE
PUBLIC SERVICE COMMISSION OF WISCONSIN

Application for a Certificate of Public Convenience and Necessity to Construct And Place in Service a Wind Turbine Electric Generation Facility Known as Glacier Hills Wind Park in Columbia County, Wisconsin	)))))	Docket No. 6630-CE-302

REBUTTAL TESTIMONY OF DR. MARK ROBERTS
ON BEHALF OF WISCONSIN ELECTRIC POWER COMPANY

Q. PLEASE STATE YOUR NAME, OCCUPATION AND BUSINESS ADDRESS.

A. My name is Dr. Mark Roberts. and I am employed by Exponent, Inc. located at 185 Hansen Court, Suite 100, Wood Dale, Illinois.

Q. WHAT ARE YOUR CREDENTIALS AND TRAINING?

A. I am a Principal Scientist and Director of the Center for Occupational and Environmental Health in the Chicago office of Exponent, a scientific research and consulting company headquartered in Menlo Park, California. I have worked at Exponent since November, 2003. Prior to working at Exponent, I held a series of positions with advancing responsibility in the areas of public health, occupational medicine, and academia. I was employed at the Oklahoma State Department of Health from 1972 to 1990 and held a series of positions culminating in my appointment as the State Epidemiologist, a post that I held from 1979 to 1982 followed by the position of Consulting Medical/Environmental Epidemiologist from 1983 to 1990. In both of these capacities, I directed epidemiologic investigations of a broad range of health concerns, from food-borne outbreaks to cancer clusters. I was a faculty member of the Department of Preventive Medicine at the Medical College of Wisconsin from 1990 to 1997, and I completed my tenure as Associate Professor and Acting Chairman of the Department. I have also served as Corporate Medical Director for several global companies. While on faculty at the Medical College of Wisconsin in Milwaukee, Wisconsin, I was part-time Medical

Director for Wisconsin Centrifugal, a foundry in Waukesha, Wisconsin. In this role, I supervised the health monitoring programs, both company-mandated and OSHA-required, in addition to the day-to-day clinical aspects of the employee health service. My responsibilities included biological surveillance of employee population as well as worksite reviews and inspections.

I earned a Master's degree in Education in 1972, an M.P.H. in Epidemiology and Biostatistics in 1974, and a Ph.D. in Epidemiology and Biostatistics in 1979. I completed medical school in 1986, an internship in Family Medicine in 1987, and a residency/fellowship in Occupational and Environmental Medicine in 1990. I am a Fellow of the American College of Occupational and Environmental Medicine. I have unrestricted licenses to practice medicine in Oklahoma, Wisconsin, and Illinois. In addition to my employment experience, I am a past member (2000–2007) and current member (2008–2011) of the Board of Directors for the American College of Occupational and Environmental Medicine in Arlington Heights, Illinois. I have been a member of the Board of Directors of Vysis, Inc. in Downers Grove, Illinois and the Board of Scientific Counselors for the Agency for Toxic Substances and Disease Registry in Atlanta, Georgia. In addition, I have served as an active participant on numerous state and national professional committees. My Curriculum Vitae is submitted as Exhibit 26.

Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY?

A. My testimony responds to that submitted by Richard James on behalf of CWESt. Mr. James relies heavily on assertions of negative health effects due to wind turbines advocated by Dr. Nina Pierpont and others. The focus of my testimony is fourfold: (i) to give an overview of public health and epidemiology principles implicated by an inquiry into the health effects of wind turbines; (ii) to review the health claims that Dr. Pierpont attributes to wind turbines, and to evaluate the methodology and scientific process that she utilizes in her analysis; (iii) to address the scientific process and compare and contrast what Dr. Pierpont has described as her process of coming to the conclusions that she is proposing; and (iv) to assess other health claims that have been made in light of what the peer-reviewed, published literature tells us about exposure to sound.

Q. WHAT ARE THE OPINIONS THAT YOU WILL BE GIVING IN THIS CASE?

A. My opinions can be summarized as follows:

1. "Wind Turbine Syndrome" is not a medical diagnosis supported by peer reviewed, published, scientific literature;

2. The materials presented to support "Wind Turbine Syndrome" are not of sufficient scientific quality nor have they received the rigorous scientific review and vetting that is customarily part of the peer review and publishing process;

3. The tried and true scientific method of developing a hypothesis, testing that hypothesis, publishing the results and having others attempt to repeat the research has not been done to test the existence of a health condition called "Wind Turbine Syndrome;"

4. An accumulation of anecdotal interviews with self-selected persons living near a wind turbine does not constitute an epidemiological study and is not sufficient to determine causation;

5. The bases for claimed adverse health effects due to wind turbines cited by Mr. James either cannot withstand scientific scrutiny or have nothing to do with wind turbines; and

6. Siting a wind turbine within view of a residence and the operation of that turbine could be a source of annoyance to those living in the residence.

Q. WHAT IS THE PRACTICE OF OCCUPATIONAL AND ENVIRONMENTAL MEDICINE?

A. Occupational and Environmental Medicine is a medical subspecialty that is recognized by the American Board of Medical Specialties and is one of the population-based specialties of Preventive Medicine. Specialists in this area are physicians with advanced training in preventative medical care of populations. Occupational and Environmental Medicine focuses on workplace/health interactions, including workplace-related illnesses and injuries, and workplace effects on non-work-related conditions. Occupational and Environmental Medicine physicians are also trained to assess the possible causes of a worker's health condition. This specialty draws heavily on the key tenets of epidemiology, biostatistics, industrial hygiene, risk assessment, and toxicology. I relied extensively on my training in this field to reach my conclusions in this matter.

Q. WHAT IS EPIDEMIOLOGY?

A. Epidemiology is the study of distribution and dynamics of factors in populations. The practice of medicine, in contrast, is devoted to preventing, alleviating or treating diseases and injuries in individuals. Both play a valuable role, but each is a tool to be used in its own sphere. Concerned with disease in populations, epidemiology does not establish the cause of an individual's disease. This question, sometimes referred to as specific causation, is beyond the domain of the science of epidemiology. Epidemiology is a statistical science, used to identify associations between risk factors and illnesses of populations, rather than actual causes of illness in individuals. By its very nature, epidemiology focuses not on the symptoms, signs, diagnosis, etiology, treatment, or prognosis of individuals, but, rather, upon symptoms, incidence, prevalence, distribution, and risk factors for disease in whole groups. To examine such issues, it is necessary for the epidemiologist to achieve an understanding of the many variables that can affect the health of human communities, but it is not necessary, nor appropriate, to attempt to diagnose individuals. Epidemiology addresses whether an agent can be linked to a cluster of cases, but not whether an agent caused a specific individual's disease. So while epidemiologists cannot diagnose individuals, they can establish the defining characteristics of clusters of illnesses, such as the point in time at which a given pathogen from a specific source began to cause problems and when it stopped.

Epidemiology is considered the cornerstone methodology in all of public health research, and is highly regarded in evidence-based medicine for identifying risk factors for disease and determining optimal treatment approaches to clinical practice. Epidemiology is the scientific study of factors affecting the health and illness populations, and, in this capacity, it serves as the foundation and logic of interventions made in the interest of the public's health and preventive medicine.

Epidemiological studies are generally categorized as descriptive, analytic (aiming to examine associations, commonly hypothesized causal relationships), and experimental (a term often equated with clinical or community trials of treatments and other

interventions). Case reports and case series are not epidemiological studies because they have no comparison group.

These principles are addressed in more depth in my white paper, which is attached as Exhibit 27.

Q. WHY IS IT IMPORTANT THAT SCIENTIFIC RESEARCH BE PUBLISHED IN PEER REVIEWED SCIENTIFIC JOURNALS?

A. These are accepted methods used in the scientific world to evaluate research. The act of submitting an article for publication has in the past meant that there was a rigorous process of review and analysis to assess its scientific merit, its contribution to the scientific body of knowledge in the specific area and was pertinent to the area covered by the journal. Publication has taken on a much broader scope today with the advent of the internet. It is now possible to "publish" views, opinions and hypotheses without the rigor of critical review. The growth of research and the number of researchers has increased the competition for publication space in journals worldwide. Today, manuscripts get reviewed at the journal editor level and those that are judged worthy of consideration (25%) are sent to the peer review panel members and roughly 10% of those get accepted for inclusion in a journal. So the peer review, publication process carefully scrutinizes the major aspects of the manuscript down to checking the numbers in the tables.

Q. WHY IS THAT IMPORTANT?

A. This is a process that has evolved over time to ensure quality of scientific articles and that the journals are contributing to the professional society of the journal's readership. This review process is imperfect but it has evolved into a system that strives to safeguard science while educating its readers. There have been "journals" that have started with commercial or special interest goals and the internet has seen this route of getting opinions and hypothesis out into public view but the scientific rigorous review is not guaranteed in these publication routes.

Q. DOES DR. PIERPONT'S BOOK RISE TO THE LEVEL OF "PEER REVIEWED, PUBLISHED" LITERATURE?

A. No. I have only read a pre-release copy of her book but the publisher's website http://www.windturbinesyndrome.com/ gives some additional insight as to her research and she has given testimony, news interviews and written reports that indicate her methodology and process. My assessment is that the material describing the phenomena does not appear to have been peer reviewed in a critical, blinded fashion in the same manner as the articles published in the leading medical journals. In addition, some of the references that I have seen cited are newspaper articles, TV interviews and addresses before legislative bodies. Those are not traditional formats to present scientific data. It shortcuts the review process that is part of the scientific process of discovery.

Q. WHAT IS THE "SCIENTIFIC METHODOLOGY?"

A. For an idea or an observation to be assimilated into the science knowledge base, it must first come to someone's attention. That can be an astute observation or a series of events that catches the attention of a science minded individual (a researcher). The individual weights the observation against what they know and makes a decision to pursue the observation further. In previous times, the next step was the preparation of a case report or a report of a case series and to submit it to a peer-reviewed journal. This was a way of alerting others about the observations and checking to see if they had made the same observation or if they had additional insight. An alternative is to present the case report or case series at a professional meeting. Both methods are an attempt to do a "reality check" on the observation.

Today, case reports or case series are seldom if ever accepted for publication by the leading science journals. Instead, the next step is to do a scientifically based study, an epidemiological study that allows the researcher to make comparisons between those with and those without the condition or effect in order to determine if an association is apparent in order to determine whether those who are "exposed" are more likely to manifest the health condition than the "non-exposed" or the "expected number." A good example of this is the investigation of a foodborne outbreak where epidemiologists compare the rate of occurrence of illness in those persons who ate the suspect food item to the rate of symptoms among those who did not eat the suspect food item. The key to

this step in the scientific method is that there is a comparison group. That is not present in a case report or a series, where the researcher is making a guess or speculating but cannot make a statement about the risk. In an epidemiological study, a method of comparison is included that will allow the researcher to evaluate the strength of the association.

One epidemiological study does not prove causation. The researcher that publishes the first study is the one that alerts his or her peers and hopefully stimulates them to do more research to explore the association. Thus the scientific knowledge base is strengthened by the collective work of different researchers, using different epidemiological methods, in different study populations combining their research. This body of research around the original observation is then evaluated to see if there is sufficient scientific information to support that a cause for the condition has been identified and is scientifically justifiable. The criteria presented by Sir Bradford Hill are most often referred to as the guidance used to go from a claim of association to one of causation.

Q. WOULD YOU CONSIDER THIS HEARING PROCESS A PART OF THE "SCIENTIFIC METHODOLOGY?"

A. No, in many ways I see the legal process represented here as having the potential to hinder or shortchange science. The tradition of science is that a researcher makes an observation. Say X is often seen in association with Y. They tell his or her peers, their fellow researchers, about their hypothesis through letters to the editor of a journal, a case report, a newsletter or maybe a presentation at a scientific meeting. The original researcher usually rushes to get a more thorough evaluation of the hypothesis so that they can "claim" the hypothesis but the critical point is that the peers do independent research to evaluate the hypothesis and they too submit their research results for publication. Getting something published in a credible journal can take time and effort. The key being that the research is independently reviewed by others in the field. This is an important step and usually insures a critical evaluation of the assumptions and data that form the basis of the research.

This hearing process will determine whether, and on what terms, Wisconsin Electric will be allowed to erect wind turbines. In this process, information from a variety of sources is presented. This evaluation process does not have the rigor of the scientific methodology whereby researchers debate, evaluate and study health issues. As a judge once pointed out when I indicated it often takes decades to answer a health research question, "we don't have that much time in the hearing process." That judicial time line often forces observations into the hearing process that have not been properly vetted in the scientific community and are often not confirmed in additional research.

Q. ARE YOU SAYING THAT DR. PIERPONT'S HYPOTHESIS IS INCORRECT?

A. Dr. Pierpont's research does not meet the standard set forth above. In addition, Dr. Pierpont presents her case series information as though it was an epidemiological study with an appropriate comparison group. This is not correct. She takes her observations and attempts to justify her hypothesis by bridging to a number of clinical concepts through some rather tenuous process in order to achieve some sort of medical basis for her opinion. I have found no clear evidence that her hypothesis has been adequately tested scientifically nor has it been thoroughly researched in a critical and unbiased fashion nor published in a peer reviewed, scientific publication. I have found that several of the references that she has cited in support of her hypothesis concerning low frequency noise and infrasound have been misquoted or applied in a manner not consistent with the hypothesis of the paper she was referencing.

Q. IS THAT JUST ANOTHER WAY OF SAYING DR. PIERPONT IS WRONG?

A. I do not feel that her hypothesis has been tested and therefore it can not be accepted as true and be used to determine that "Wind Turbine Syndrome" even exists. I believe it is more accurate to classify her statements as opinions that are unsubstantiated in the peer reviewed, published, scientific literature. Everyone has opinions. The key to the evaluation of those opinions is to look behind them to the assumptions being made and the scientifically based information that forms the foundation of the opinion. In legal terms one must find general causation, that is there must be a body of scientific literature that indicates that the exposure causes the condition before one can move to the

assumption of specific causation. A treating physician may in the course of treating a patient disregard the scientific literature and base their treatment on experience, beliefs or intuition but there is a major effort to apply "evidence based medicine" in the practice of medicine which includes rendering opinions regarding diagnosis of conditions and rendering opinions regarding causation. The evidence found in the peer reviewed, published literature does not support Dr. Pierpont's hypothesis that there is a health condition called "Wind Turbine Syndrome" caused by infrasound or low frequency sound.

Q. HOW IS THE "CAUSE" OF A MEDICAL CONDITION DETERMINED?

A. Even though a doctor describes a set of reported symptoms as a "syndrome," that statement must be researched before it is accepted in the medical community. Surprisingly, the confirmation of the "cause" of a set of symptoms is not always the primary goal of a physician but rather symptom relief and the prevention of the worsening of the condition and or transmission of the condition to another person is the center point of the treating physician's effort. The best example is the recommendation by the health department to not test every person with flu-like symptoms to confirm that they are suffering from H1N1 influenza infection. Determination of the cause of a medical condition is comparable to solving a medical mystery and the "clues" of the medical mystery are lab test results and the matching of symptoms with known medical conditions.

Q. HOW ARE "EPIDEMIOLOGICAL METHODS" USED TO DETERMINE CAUSATION?

A. Epidemiology is basically the methodology used to characterize a health condition among a group of people. Epidemiological research starts with a scientific hypothesis which is then investigated and the information is critically reviewed, and circulated among interested parties (other researchers and clinicians). The totality of this research then forms the material to answer the question of "Is there an association between exposure and the health condition." Association is not the same as causation. Two things can be associated but one does not necessarily cause the other. Determination of causation is a

higher level of data assessment and requires transparent analysis of the data to determine if the association is actually causal. Not all associations turn out to be causal. If the data is not carefully reviewed, a causal relationship may be erroneously assigned to the relationship.

Q. MR. JAMES ALSO CITES OTHER HYPOTHESES IN SUPPORT OF HIS CONCLUSION THAT INFRASOUND AND LOW FREQUENCY NOISE FROM WIND TURBINES CAUSE ADVERSE HEALTH EFFECTS. ARE YOU CONVINCED?

A. No. An underlying theme in the evaluation of wind turbine health claims made in Mr. James's report, testimony and literature references center on new unproven health theories or new diseases that have not been accepted in the mainstream medical and scientific community. As discussed in an earlier response, "Wind Turbine Syndrome" is not a recognized medical condition and has not been confirmed in the customary fashion of the scientific literature. Dr. Pierpont, despite her assertion, has not submitted nor received critical, unbiased review and acceptance of her observations.

A process similar to this is observed when Mr. James's claims regarding "Vibroacoustic Disease" are explored. A review of the NCBI "PubMed" database contains 36 published references when searched for the term "vibroacoustic disease." Of these 36, 30 have common authors including Brancho, Alves-Perira and Ferreira who have been referred to as the "VAD Team" that has been the proponents of the entity they refer to as "Vibroacoustic Disease." These researchers first published their observations involving "Vibroacoustic Disease" that they classify as "non-auditory, noise-induced biological effects" in 1999 and have actively published regarding their theories of the "biological effects of infrasound (0-20Hz) and low frequency noise (20-500Hz)." By their own description, there has been "much controversy and acrimonious debate over whether or not acoustical phenomena can cause extra-auditory effects on living organisms." It is not evident from a review of the published literature that the findings of these researchers have been confirmed by others or accepted in medical or acoustical professions.

Mr. James makes similar unfounded or overbroad statements regarding potential health effects of low frequency noise and health in his statements in Exhibit 808. Mr. James attempts to make the case for health effects using unproven, unconfirmed observations about noise-related health conditions. For example, his discussion of Dr. D. Ingber is misleading in that Dr. Ingber's work on "tensegrity" and "mechanotransduction" is actually an exploration of the cellular response to mechanical forces, having nothing to do with sound. The bolded quote on page 9 of Mr. James's Exhibit 808 gives the appearance of being from Dr. Ingber but in fact if you go to http://www.newmexicocare.org/1pages/vad.html#vad the language is not a quote from Dr. Ingber.

In a similar fashion, Mr. James indicates that Drs. Todd, Roengrenm and Colebatch support the application of their research in support of the claim of adverse health effects being associated with wind turbines. A review of this work does not indicate that this is a correct statement.

Q. YOU CONDUCTED A REVIEW OF THE PEER REVIEWED LITERATURE ON HEALTH EFFECTS ATTRIBUTABLE TO SOUND. WHAT DID IT SHOW AS IT RELATES TO SOUND GENERATED BY WIND TURBINES?

A. Our search of PubMed identified 156 articles that mentioned "Infrasound and Health Effects" or "Low-Frequency Noise and Health Effects" or "Low-Frequency Sound and Health Effects" or "Wind Power and Noise," "Wind Turbines" or "Wind Turbines and Noise." Our search and review of the peer reviewed, published literature did not identify scientific works that support the health effects claims being made regarding wind turbines. Please refer to our report "Evaluation of the Scientific Literature on the Health Effects Associated with Wind Turbines and Low Frequency Sound," submitted as Exhibit 27.

Q. BOTTOM LINE: ARE YOU OF THE OPINION THAT WIND TURBINES CAUSE A HEALTH CONDITION?

A. This is a complex question to answer in that a "health condition" does not always equate to a "disease." There are good health conditions and bad. Some things a lay person might label "health conditions" refer to a normal process where the body's defense mechanism has gotten over active and resulted in a person not feeling well, as in allergies. A review of the material that is often used in support of the claim that there are health conditions associated with wind turbines indicates that many (if not all) are rooted in the normal physiological response to an adverse situation and most have a component of "annoyance."

Q. WHAT ARE YOU REFERRING TO WHEN YOU SAY "ANNOYANCE?"

A. Annoyance is a normal reaction to some type of stimuli or thought. It is a normal set of physiological responses to a stimuli that is unique to the individual and is based on personal experience, beliefs and circumstances of occurrence. In today's environment, noise pollution constitutes a significant factor of annoyance. The meaning listeners attribute to the sound influences annoyance, so that, if listeners dislike the noise content, they are annoyed. What is music to one is noise to another. If the sound causes activity interference, noise is more likely to annoy (for example, sleep disturbance). Control of the noise is an important factor in the annoyance quality of a noise. If the annoyed person can control the annoying sound, they can modulate the annoyance factor. However, if listeners believe that the noise is subject to third-party control, including police, but control has failed, they are more annoyed. If the sound is appropriate for the activity it is in context. If one is at a race track the noise is in context and the psychological effects are absent. If one is at an outdoor picnic the race track noise will produce adverse psychological and physical effects. The term "annoyance" is broad in definition and is imprecise. There is no indication that the "annoyance" due to wind turbines is any different from the "annoyances" that we each experience on a daily basis.

Q. DOES THIS CONCLUDE YOUR REBUTTAL TESTIMONY?

A. It does.