AFFIDAVIT

INGHAM COUNTY)
STATE OF MICHIGAN) ss:

RICHARD R. JAMES, being duly sworn, under penalty of perjury, deposes and says:

1. I am an acoustical engineer with over 35 years of experience addressing community noise for new and existing industrial and commercial facilities and am currently the Principal Consultant for E-Coustic Solutions, of Okemos, Michigan. My resume is attached.

2. In those 35 years I have personally conducted noise impact studies and assessments and reviewed such studies and assessments provided by other acoustic throughout the U.S., Canada, Mexico, and Europe.

3. I have been a Full Member of the Institute of Noise Control Engineers (INCE) since 1973. INCE qualifies professionals in the field of acoustics and noise control engineering, and promotes these professions by developing standards and conferences on noise assessment standards and procedures.

4. From 1983 until 2006 I was President of James, Anderson & Associates, Inc., an acoustical consulting firm whose clients included Fortune 100 companies,

including General Motors, Ford, Chrysler, Goodyear Rubber Company, Anheuser Busch and Deer and Company, as well as many smaller firms, with a staff of over 40 acoustical engineers, industrial hygienists and technicians.

5. In 2006, I founded E-Coustic Solutions, through which I now provide my consulting services.

6. I am very familiar with the acoustic measurement and noise assessment procedures published by standard-setting organizations American National Standards Institute (ANSI), Acoustical Society of America (ASA), International Organization for Standardization (ISO), and with comparable procedures issued by the New York State Department of Environmental Conservation (NYSDEC) and other agencies.

7. I was a member of the ANSI S12 Committee from the mid-1990s until 2006. The S12 Committee has oversight responsibilities for acoustical test methods and procedures published as ANSI S12 standards, in various parts, and used to standardize the work of acousticians and noise control engineers for measuring sound and assessing land use compatibility of various noise sources.

8. In 2009 I participated in the ASA's update of community noise sound levels in the United States. This is the first re-evaluation of the background sound levels in communities since the early 1970's when it was first conducted under the auspices of the U.S. EPA.

9. I understand my affidavit will be used in litigation based on a petition brought on behalf of Concerned Citizens of Cattaraugus County, Inc. (CCCC) to

challenge the failure of the Town of Allegany Planning and Town Boards to comply with the Allegany zoning ordinance, which requires project sound measurements subject to town approval to comply with ANSI S12.9-1993, Parts 1, 2 and 3 or comparable procedures for assessing noise. The petition involves the town's approval of the Allegany Wind Project proposed by a subsidiary of Everpower Renewables, Allegany Wind, LLC, and I reviewed the sound study upon which the approval relies.

10. I first became involved with assessing noise impacts of industrial wind turbine projects in 2006, when this was a relatively new industrial noise source. At that time a small and since ballooning professional literature in acoustics and atmospheric science was developing to understand why wind project sponsors' procedures for assessing noise impacts failed regularly to predict a high level of complaints about the noise once projects became operational. Since then I have developed wind farm siting criteria for county and township governments, conducted over 25 acoustical tests of operating wind turbines, conducted over 40 pre-construction background sound studies in communities proposed as host site for a wind farm, and provided testimony at zoning hearings and public statement hearing for community groups and municipal clients in Michigan, Ohio, Wisconsin, Illinois, West Virginia, Pennsylvania, Maine, New York, Oregon, Washington, Colorado, the U.K. and New Zealand.

11. In 2008 acoustic engineer George Kamperman and I were asked by ASA and ANSI to participate in a formal review and comment process on the current draft revision to the International Electrotechnical Commission (IEC) standard 61400-11 for

measuring wind turbine sound power levels. IEC 61400-11 is an international standard utilized worldwide to produce the sound data input into sound propagation models by wind project developers. All suggestions submitted by Dr. Kamperman and I were adopted by the U.S. ANSI/ASA committee charged with review of the IEC standard.

12. My collaboration with Kamperman also resulted in a comprehensive review of the research literature on the health and safety effects of exposure to wind turbine noise in communities located near utility-scale wind farms, published by INCE in 2008. This review is in two parts entitled "The 'How To' Guide to Siting Wind Turbines to Prevent Health Risks from Sound," designed for local officials faced with wind farm siting decisions, and a more technical entitled "Simple guidelines for siting wind turbines to prevent health risks."

13. The Kamperman and James articles show that accurate predictions of community noise impacts of wind farms can be derived from ANSI standards and comparable procedures.

14. I understand the Kamperman and James articles were submitted to the Allegany Planning Board during the board's review of the Everpower wind project proposal.

15. The Kamperman and James review includes recommendations for siting industrial wind turbines in a manner that will avoid or minimize the most serious effects on community noise levels based on current scientific research, ANSI, ASA, International Standards Organization (ISO) and other generally accepted procedures.

16. Recently the Minnesota Public Health Department issued it own comprehensive review of the research literature on the health and safety effects of exposure to wind turbine noise which covers much of the same literature as did the Kamperman and James articles, and credits the Kamperman and James articles as a basis for its own conclusions, which are similar to ours. Specifically, the Minnesota Public Health Department review concludes that a minimum setback required to avoid or minimize adverse impacts from wind turbine noise is one kilometer. Relevant excerpts from the Minnesota review are attached.

17. I understand the Minnesota Public Health Department review was submitted in its entirety to the Allegany Planning and Town Boards during the boards' review of the Everpower wind project proposal.

18. Current scientific studies and my own experience assessing operating wind farm noise establish that nuisance and adverse heath effects occur for a significant fraction of the population living one kilometer from a wind project like the Allegany Wind Project.

19. The long-term background sound level as defined and measured according to ANSI standards, is the proper starting point for assessing community response to a new noise source. ANSI S12.9 Part 1 specifies the use of the L_{90} measure for residual background sound level, which reflects the quietest 10 percent of the measurement period. ANSI S12.9 Part 1 specifies that ambient sound levels include all sounds in the environment. However, for nighttime periods, where man-made noises are at a minimum,

the residual background and the ambient sound levels ordinarily will differ very little, by about 1 or 2 decibels. For nighttime periods, based on available research and my experience measuring community background sound levels, rural areas away from heavily trafficked roads experience a background sound level of about 25 decibels, "A-weighted," which reflects the most audible frequencies, or 25 dBA.

20. I conducted a background sound study at residential locations in the vicinity of the Allegany Wind Project and submitted the study to the Allegany Planning and Town Boards during the boards' review of the Everpower wind project proposal. Based on the study I found that background sound levels at those locations were between 22 and 28 dBA at night at those locations utilizing the L_{90} measure.

21. The Allegany Planning Board retained environmental consultants Conestoga Rovers Associates (CRA) based in Ontario, Canada, and directed CRA to conduct measurements of background sound levels at selected residential locations in the vicinity of the Everpower project. CRA found that background sound levels at those locations were between 18.3 and 29 dBA utilizing the L_{90} measure.

22. Everpower's sound study for the Allegany Wind Project utilizes an average measure for background sound level in the vicinity, contrary to the generally accepted understanding of a community's background sound level. This is a defined term in acoustics, defined for example in ANSI standards and procedures, which specifies that L_{90} rather than an average sound level be used to determine background sound level. To include the noisiest conditions in the baseline from which impacts are assessed and not

the quietest conditions is novel and departs from generally accepted practices for land use planning and evaluating a community's reaction to a new noise source. Generally accepted procedures for land use planning assess a new noise source against the quiet times of the community not the noisy times when complaints would be unlikely.

23. NYSDEC has a procedure for assessing noise impacts issued as a policy document. The NYSDEC procedure emphasizes an evaluation of the degree to which project noise exceeds the existing background sound level. The procedure recommends limiting noise impacts to no more than 6 dBA above background. Greater increases are predicted to result in community complaints, and are classified qualitatively as "very noticeable to intolerable" if they reach 20 dBA or more above background.

24. NYSDEC reviewed the Everpower sound study submitted to the Allegany Planning Board and relied upon by both the Planning and Town boards and submitted comments to the Planning Board criticizing the study. Specifically, NYSDEC recommended that the L_{90} measure be utilized for background sound level, noted that its noise assessment procedure calls for the addition of a "penalty" of 10 dBA added to modeled project sound levels for noise operating at night, and noted that its procedure calls for evaluating impulsive noise like wind turbine noise by adding additional decibels.

25. In the responses to comments included in the project Final Environmental Impact Study, approved and issued by the Planning Board on July 11, 2011, alternative standards are identified that recommend noise from wind turbines be permitted to reach 40 dBA at nearby residences, but these standards are provided by wind industry trade

associations, including the American Wind Energy Association and the Canadian Wind Energy Association, or by political organizations, and no basis for those standards is identified.

26. The Everpower sound study concludes, without the addition of any penalty, that residences within one kilometer of the Allegany Wind Project but farther away than 2,500 feet will experience project sound levels just under 40 dBA.

27. Under the NYSDEC noise assessment procedure, where a resident who enjoys quiet nights with sound levels approximately 18.3 dBA, it must be concluded that a project sound level of 40 dBA at that location will be experienced as "very noticeable to intolerable."

28. In several technical comment letters I prepared for submission to the Allegany Planning and Town boards on behalf of CCCC during the boards' review of the project, I commented on several deviations from ANSI standards or comparable procedures found in the Everpower sound study, concluding that the study cannot be relied on for a realistic prediction of the effect of the project on those living within the vicinity. My May 26, 2011 comments, summarizing much of my previous comments submitted to the town, are attached.

29. For example, ISO 9613-2 is a standard governing measurement of sound outdoors and provides that calculated or measured sound levels may be discounted by applying a "ground absorption" factor, representing the degree to which intervening ground will absorb and thus diminish sound effects of a noise source over distance.

However, the standard states that application of a ground absorption factor will not generate accurate results for noise sources elevated 30 meters or more.

30. In response to this comment the project sponsor's acoustic consultant acknowledged that wind turbines are out of range of the ISO 9613-2 procedure, but applied a discount for ground absorption anyway.

31. The result of an improperly applied ground absorption factor is that project noise was under calculated by 8 to 11 dBA. *See* James, May 26, 2011 letter to Allegany Planning Board, p. 2.

32. ISO recommends setting a base limit of 35-40 dBA for noise impacts at residences and adjusting the limit by district type and time of day. For rural areas, the recommended levels are 35 dBA during daytime and 25 dBA during late overnight hours.

33. As discussed at length in my May 26, 2011 comments to the town, chronic exposure to noise levels substantially exceeding the ISO standards results in adverse health effects and frequent complaints.

34. The World Health Organization (WHO), in *Guidelines for Community Noise*, ch. 3, "Adverse health effects of noise," pp. 44-46 (1999), available at <http://www.who.int/docstore/peh/noise/guidelines2.html>, considers sleep disturbance to be an adverse health impact. According to WHO, "primary physiological effects . . . induced by noise during sleep, includ[e] increased blood pressure; increased heart rate; increased finger pulse amplitude; vasoconstriction; changes in respiration; cardiac

arrhythmia; and an increase in body movements." "Exposure to night-time noise also induces secondary effects, or so-called after effects . . . includ[ing] reduced perceived sleep quality; increased fatigue; depressed mood or well-being; and decreased performance." Waking up in response to nighttime noise decreases as people get habituated to the noise; however, "habituation has been shown for awakenings, but not for heart rate and after effects such as perceived sleep quality, mood and performance."

35. The same WHO document, at p. 58, states that: "If the noise includes a large proportion of low-frequency components, values even lower than the guideline values [30 dBA inside the home] will be needed, because low-frequency components in noise may increase the adverse effects considerably."

36. IEC 61400-11, which is the standard for reporting wind turbine sound emissions in manufacturer's specifications, acknowledges that industrial wind turbines emit a strong low frequency component.

37. Current scientific research into wind turbine noise has concludes that its low frequency component increases as modern turbines get larger.

38. This is confirmed by surveys of people living near wind farms, which establish that wind turbine noise is more annoying than traffic, airport and rail noise measured at the same A-weighted level.

39. This is also confirmed by actual measurements at operating wind farms. For example, based on a full year of measurements every half-hour at a wind farm in Germany, a leading study by van den Berg found most sound energy generated by

industrial wind turbines occurs at low frequencies, and my own measurements have found that wind turbine noise "can penetrate the home's walls and roof with very little low frequency noise reduction." *See* Kamperman and James, "The 'How To' Guide to Criteria for Siting Wind Turbines to Prevent Health Risks from Sound," p. 3.

40. "For sounds that contain a strong low frequency component, which is typical of wind turbines, WHO says that the limits may need to be even lower than 30 dBA to avoid health risks." Id.

41. The adverse impact of low frequency sounds is greater when noise pulses or modulates. Accordingly, NYSDEC policy calls for adding penalty decibels for pulsating noise sources.

42. NYSDEC recommended to Allegany that such a penalty should be applied to the results of Everpower's sound study.

43. Wind turbine noise pulses repeatedly at about one second intervals for a three-blade turbine, creating a "whoosh" or "thump" followed by relative quiet. This occurs because the width and height of the area swept by rotor blades is about 100 yards, and because wind speed at the top of the blade revolution often differs substantially from the wind speed at the bottom. This occurs more frequently at night than during the daytime. When blades pass across the boundary between two different wind speeds they vibrate at low frequency, creating a characteristic "whoosh" or "thump" noise.

44. Van den Berg also found that low frequency emissions from wind turbines are most pronounced at night, when it is common to experience calm or stable

atmosphere at near-ground heights at the same time that operational wind speeds occur at the height of industrial wind turbines. Van den Berg found that near-ground calm at night occurs because after sunset low level air cools, slows and "shears" away from elevated air, which continues to blow. Above the wind shear zone wind speeds are sufficient to operate the turbines, and thus generate noise.

45. My own and other independent acoustic consultants' measurements of operating wind farms have confirmed van den Berg's finding that wind shear occurs about half the time wind turbines operate, and more often at night.

46. It is also well-established, and my own and other independent acoustic consultants' measurements of operating wind farms have confirmed that wind turbines operate more often at night than in the day time.

47. In my professional opinion, the adoption of a 40 dBA noise limit in a rural community is entirely unreasonable if the goal is to provide minimal protections for residents from the adverse impacts of noise at night. There are no ANSI standards or comparable procedures, and indeed no science-based community noise standards of which I am aware that would justify such a limit.

48. Based on my professional experience, I expect that the families living within one kilometer of industrial wind turbines in Allegany will be subjected to levels of annoyance, sleep disturbance and other negative impacts of wind turbine noise, should a wind farm be sited under the noise assessment procedures adopted by the Allegany Planning and Town boards. In fact, I am personally aware of communities where a 40

dBA noise limit within one kilometer has been allowed, without applying any adjustments to account for low frequency, impulsive and night time noise, a wind farm has been constructed and is operating in compliance with such standards, and a number of families predicted not to suffer intolerable nuisance noise levels have abandoned their home as a result of wind turbine noise.

RICHARD R. JAMES

Subscribed and sworn to before me
this 26 day of SEPTEMBER, 2011

NOTARY PUBLIC

JIM CLARK
NOTARY PUBLIC, STATE OF MI
COUNTY OF INGHAM
MY COMMISSION EXPIRES Jul 26, 2017
ACTING IN COUNTY OF
INGHAM

ATTACHMENTS

1. Resume of Richard R. James

2. G. Kamperman and R. R. James, "The 'How To' Guide to Siting Wind Turbines to Prevent Health Risks from Sound" and "Simple guidelines for siting wind turbines to prevent health risks" (Institute of Noise Control Engineering, 2008)

2 3. Minnesota Department of Health, Environmental Health Division, "Public Health Impacts of Wind Turbines" (May 22, 2009), excerpts; available in full at <http://www.health.state.mn.us/divs/eh/hazardous/topics/windturbines.pdf>

3 4. Richard R. James, Letter to Allegany Planning and Town Boards, dated May 26, 2011