

HEALTH DEPARTMENT

Brown County

610 S BROADWAY STREET
P. O. BOX 23600
GREEN BAY WISCONSIN 54305-3600
PHONE (920) 448-6400 FAX (920)448-6449

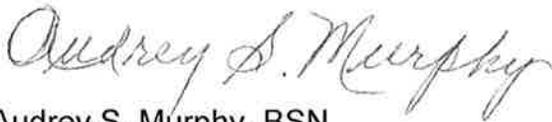
JUDY FRIEDERICHS, R.N., B.S.N.
DIRECTOR

January 18, 2012

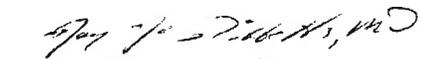
On January 10, 2012, the Brown County Board of Health adopted the enclosed resolution requesting emergency State aid for families suffering around industrial wind turbines; and supported Wisconsin Citizens Safe Wind Siting guidelines (PSC Ref#157326).

We urge your consideration and support of these issues.

Sincerely,



Audrey S. Murphy, BSN
Chairman
Brown County Board of Health



Jay J. Tibbetts, MD
Vice-Chairman
Brown County Board of Health



Brown County Board of Health Resolution Requesting Emergency State Aid for Families Suffering Around Industrial Wind Turbines

WHEREAS the Public Service Commission of Wisconsin's wind siting rules ('PSC 128') were created without oversight of a medical professional "...who is a University of Wisconsin System faculty member with expertise regarding the health impacts of wind energy systems." as mandated in 2009 WISCONSIN ACT 40. Jevon D. McFadden, MD, MPH (the Medical Doctor appointed to this role) publically acknowledged that he did not meet these criteria.

WHEREAS in the May 25, 2010 presentation made by Jevon D. McFadden, MD, MPH to the Brown County Board of Health, on behalf of the Wisconsin Department of Health Services - Division of Public Health, the State recognized and acknowledged that "*Gaps remain in our knowledge of the impact that wind energy may have on human health...*" but has failed to take any action to fill these gaps.

WHEREAS the Public Service Commission of Wisconsin's wind siting rules ('PSC 128') were suspended on March 1, 2011 by the Joint Committee for Review of Administrative Rules (JCRAR) stating that its contents "...create an emergency relating to public health, safety, or welfare; are arbitrary and capricious; and impose an undue hardship on landowners and residents adjacent to wind turbine sites."

WHEREAS the State of Wisconsin has failed to remedy this "*emergency relating to public health, safety, or welfare*" by carrying out the mandate of 2009 WISCONSIN ACT 40 which requires the State to enact wind siting standards that "...include setback requirements that provide reasonable protection from any health effects, including health effects from noise and shadow flicker, associated with wind energy systems..."

WHEREAS the State's inaction to enact wind siting rules that protect human health and safety has allowed development of the industrial wind project known as Shirley Wind LLC to be constructed in the Town of Glenmore, Brown County, Wisconsin (dedicated November 2010).

WHEREAS Shirley Wind LLC has created an environment that has resulted in the very same "*undue hardships*" that the JCRAR suspension of 'PSC 128' sought to prevent. These "*undue hardships*" have forced two families to vacate their homes to regain their health and continue to force at least two other families to suffer adverse health effects significant enough that they seek refuge away from their homes but do not have the financial ability to temporarily relocate.

WHEREAS the Brown County Board of Health has attached recent (2009 and newer) references (many peer-reviewed) to this resolution, organized by year of publication, accurately describing the cause, conditions, and adverse health effects being experienced by Brown County families.

WHEREAS the Brown County Board of Health has in the past, and continues to, advocate for the health and safety of Brown County families.

THEREFORE, BE IT RESOLVED that the Brown County Board of Health formally requests temporary emergency financial relocation assistance from the State of Wisconsin for those Brown County families that are suffering adverse health effects and undue hardships caused by the irresponsible placement of industrial wind turbines around their homes and property. The State of Wisconsin emergency financial assistance is requested until the conditions that have caused these undue hardships are studied and resolved, allowing these families to once again return safely to their homes and property.

Brown County Board of Health
Industrial Wind Turbine Health Impact Supporting References

The following recent (2009 and newer) references (many peer-reviewed), organized by year of publication, accurately describe the cause, conditions, and adverse health effects being experienced by Brown County families.

2012:

Barbara J Frey, BA, MA (University of Minnesota), Peter J Hadden, BSc (Est Man) FRICS, Wind Turbines And Proximity To Homes: The Impact Of Wind Turbine Noise On Health, **January, 2012**.
http://docs.wind-watch.org/Frey_Hadden_WT_noise_health_01Jan2012.pdf

2011:

Stephen E. Ambrose, INCE (Brd. Cert.), Robert W. Rand, INCE Member, The Bruce McPherson Infrasound and Low Frequency Noise Study - Adverse Health Effects Produced By Large Industrial Wind Turbines Confirmed, **December 14, 2011**.
<http://randacoustics.com/wp-content/uploads/2011/12/The-Bruce-McPherson-ILFN-Study.pdf>

Carmen M.E. Krogh, BScPharm, Brett S. Horner, BA, CMA, "A summary of new evidence: Adverse health effects and industrial wind turbines", **August 2011**.
<http://www.windaction.org/documents/32829>

Krogh, C. M. E., "Industrial wind turbine development and loss of social justice?" *Bulletin of Science Technology & Society*, **August 2011** vol. 31 no. 4 pages 321-333.
<http://bst.sagepub.com/content/31/4/321>

Daniel Shepherd, David McBride, David Welch, Kim N. Dirks, Erin M. Hill, "Evaluating the impact of wind turbine noise on health-related quality of life," *Noise & Health*, **September 2011** vol. 13 issue 54 pages 333-339.
<http://www.noiseandhealth.org/article.asp?issn=1463-1741;year=2011;volume=13;issue=54;spage=333;epage=339;aulast=Shepherd>

Bronzaft, A. L., "The Noise from wind turbines: Potential adverse impacts on children's well-being," *Bulletin of Science Technology & Society*, **August 2011** vol. 31 no. 4 pages 291-295.
<http://bst.sagepub.com/content/31/4/291>

McMurtry, R. Y. , "Toward a case definition of adverse health effects in the environs of industrial wind turbines: Facilitating a clinical diagnosis," *Bulletin of Science Technology & Society*, **August 2011** vol. 31 no. 4 pages 316-320.
<http://bst.sagepub.com/content/31/4/316>

Environmental Review Tribunal, Case Nos.: 10-121/10-122 Erickson v. Director, Ministry of the Environment, Jerry V. DeMarco, Panel Chair and Paul Muldoon, Vice-Chair, **July 2011**
<http://www.ert.gov.on.ca/files/201108/00000300-AKT5757C7CO026-BHH51C7A7SO026.pdf>

Harrison, J. P., "Wind turbine noise," *Bulletin of Science Technology & Society*, **August 2011** vol. 31 no. 4 pages 256-261.
<http://bst.sagepub.com/content/31/4/256>

INCE/Europe, *Wind Turbine Noise 2011— Post conference report*, **April 2011**.
http://www.confweb.org/wtn2011/index.php?option=com_content&view=article&id=70:report&catid=35:information

Michael Nissenbaum MD, Jeff Aramini PhD, Chris Hanning MD, "Adverse health effects of industrial wind turbines: a preliminary report," *10th International Congress on Noise as a Public Health Problem*, **July 2011**.
http://www.healthywindwisconsin.com/Nissenbaum%20et%20al%20ICBEN2011_0158_final.pdf

2011 (continued):

Krogh, C. M. E., Gillis, L., Kouwen, N., and Aramini, J., "WindVOiCe, a self-reporting survey: adverse health effects, industrial wind turbines, and the need for vigilance monitoring," *Bulletin of Science Technology & Society*, **August 2011** vol. 31 no. 4 pages 334-345.

<http://bst.sagepub.com/content/31/4/334>

Laurie, S., "Submission to the Australian Federal Senate Inquiry on rural wind farms," by Dr. Sarah Laurie, BMBS, Medical Director Waubra Foundation, **February 2011**.

<http://docs.wind-watch.org/Laurie-Australia-Senate-submission-final.pdf>

Møller, H. & C. S. Pedersen, "Low-frequency noise from large wind turbines," *Journal of the Acoustical Society of America*, **June 2011** vol. 129 no. 6 pages 3727-3744.

<http://dx.doi.org/10.1121/1.3543957>

Phillips, C. V., "Properly interpreting the epidemiologic evidence about the health effects of industrial wind turbines on nearby residents," *Bulletin of Science Technology & Society*, **August 2011**, vol. 31 no. 4, pages 303-315.

<http://bst.sagepub.com/content/31/4/303>

Richarz, W., Richarz, H., and Gambino, T., "Correlating very low frequency sound pulse to audible wind turbine sound," INCE/Europe Fourth International Meeting on Wind Turbine Noise, Rome Italy, 12-14 **April 2011**.

Cited in: <http://windconcernsontario.wordpress.com/2011/05/23/presentation-from-the-fourth-international-meeting-on-wind-turbine-noise/>

Salt, A. N. & Kaltenbach, J. A., "Infrasound From wind turbines could affect humans," *Bulletin of Science Technology & Society*, **August 2011** vol. 31 no. 4 pages 296-302.

<http://bst.sagepub.com/content/31/4/296>

Senate Standing Committees on Community Affairs (Parliament of Australia), "The social and economic impact of rural wind farms," **2011**.

http://www.aph.gov.au/senate/committee/clac_ctte/impact_rural_wind_farms/index.htm

Shain, M., "Public health ethics, legitimacy, and the challenges of industrial wind turbines: The Case of Ontario, Canada," *Bulletin of Science Technology & Society*, **August 2011** vol. 31 no. 4 pages 346-353.

<http://bst.sagepub.com/content/31/4/346>

Shepherd, D., McBride, D., Welch, D., Dirks, K., Hill, E., Wind turbine noise and health-related quality of life nearby residents: a cross-sectional study in New Zealand. Fourth International Meeting on Wind Turbine Noise. Rome Italy **April 2011**

http://www.maine.gov/dep/ftp/bep/ch375citizen_petition/pre-hearing/AR-30%20chapter%20375%20-%20r%20brown%20hearing%20submission%20-%20Shepherd%20et%20al%20Wind%20turbine%20noise%20%20Quality%20of%20Life%20Rome%202011.pdf

Thorne, B., "The Problems with 'noise numbers' for wind farm noise assessment," *Bulletin of Science Technology & Society*, **August 2011** vol. 31 no. 4 pages 262-290.

<http://bst.sagepub.com/content/31/4/262>

Vanderburg, W. H., "Assessing our ability to design and plan green energy technologies," *Bulletin of Science Technology & Society*, **August 2011** vol. 31 no. 4 pages 251-255

<http://bst.sagepub.com/content/31/4/251>

Oregon Health Authority, Oregon Public Health Division, Office of Environmental Public Health, "Health impacts of wind energy facilities," **2011**.

<http://public.health.oregon.gov/HealthyEnvironments/TrackingAssessment/HealthImpactAssessment/Pages/windenergy.aspx>

2010:

Chief Medical Officer of Health (of Ontario), Report: "The potential health impact of wind turbines," **May 2010**.

http://www.health.gov.on.ca/en/public/publications/ministry_reports/wind_turbine/wind_turbine.pdf

Hanning, C., "Wind turbine noise, sleep And health"—Summary paper prepared by Dr. Christopher Hanning. BSc, MB, BS, MRCS, LRCP, FRCA, MD, **November 2010**.

http://www.acousticceology.org/wind/winddocs/health/Hanning%202010_Wind%20turbine%20noise%20sleep%20and%20health%20November%202010.pdf

Ito, A. & T. Takeda, "Sickness claims prompt study of wind turbines [by the The Environment Ministry of Japan]," *The Asahi Simbun*, **January 2010**.

<http://www.asahi.com/english/TKY201001180410.html>

National Health and Medical Research Council (of Australia). "Wind turbines and health: a rapid review of the evidence," **2010**

<http://www.nhmrc.gov.au/publications/synopses/new0048.htm>

Nissenbaum, M., Press conference by Michael Nissenbaum, MD Radiologist in Vermont's State House, May 7, **2010**, (video).

<http://vimeo.com/11577982>

Pierpont, N., Letter to the Vermont State House of Representatives from Nina Pierpont, MD, PhD, Fellow of the American Academy of Pediatrics, Co-signed by the following:

- George Kamperman, PE, President, Kamperman Associates, Inc., Board-Certified Member of Institute of Noise Control Engineers, Fellow Member of Acoustical Society of America, Member of National Council of Acoustical Consultants,
- F. Owen Black, MD, Fellow of the American College of Surgeons, Board-Certified Otolaryngologist, Senior Scientist, Director of Neurotology Research Balance & Hearing Center North West, Legacy Health System
- Joel F. Lehrer, MD, Fellow of the American College of Surgeons, Board-Certified Otolaryngologist and Head and Neck Surgeon, Served on Hearing and Equilibrium Subcommittee of the American Academy of Otolaryngology and Head and Neck Surgery, Clinical Professor of Otolaryngology, University of Medicine & Dentistry of NJ,
- Stanley M. Shapiro, MD, Fellow of the American College of Cardiology, Board-Certified Internal Medicine, Cardiovascular Diseases, and Nuclear Cardiology, Champlain Valley Cardiovascular Associates,

February 2010.

<http://docs.wind-watch.org/Pierpont-et-al.-to-Klein-2-10-10.pdf>

Punch, J., James, R., & Pabst, D., (2010), "Wind-turbine noise: What audiologists should know," *Audiology Today*, **July-August 2010**.

<http://www.windaction.org/?module=uploads&func=download&fileId=2047>

Salt, A., "Infrasound: Your ears 'hear' it but they don't tell your brain"—Powerpoint presentation by Alec N. Salt, Ph.D., Department of Otolaryngology, (2010), Washington University School of Medicine, First International Symposium on Adverse Health and Wind Turbines, **Sept 2010**.

http://windvigilance.com/downloads/symposium2010/swv_symposium_presentation_infrasound_your_ears_hear_it_2.pdf

Salt, A. N. & Hullar, T. E., "Responses of the ear to low frequency sounds, infrasound and wind turbines," *Hearing Research*, **September 2010** vol. 268 nos. 1-2 pages 12-21.

<http://www.ncbi.nlm.nih.gov/pubmed/20561575>

2010 (continued):

Thorne, R., "Assessing noise from wind farms,"—Powerpoint presentation by Robert Thorne, PhD in Health Science from Massey University, New Zealand for The Society for Wind Vigilance, First International Symposium, **October 2010**.

http://acousticecology.org/wind/winddocs/noise/swv_symposium_paper_thorne%20slides_assessing_noise_from_wind_farms%20copy.pdf

Thorne, R. (Noise Measurement Services), "Noise impact assessment report - Waubra Wind Farm," prepared by Robert Thorne, PhD in Health Science from Massey University, New Zealand, **July 2010**.

<http://docs.wind-watch.org/Dean-Waubra-Noise-Impact-July-20101.pdf>

2009:

Minnesota Department of Health, "Public health impacts of wind turbines"

<http://www.health.state.mn.us/divs/eh/hazardous/topics/windturbines.pdf>

World Health Organization, "Night noise guidelines for Europe."

http://www.euro.who.int/_data/assets/pdf_file/0017/43316/E92845.pdf

Wisconsin Citizens Safe Wind Siting Guidelines

Preface

Wisconsin is Unique

The “Wisconsin Citizens Safe Wind Siting Guidelines” that follow were born of the need to protect Wisconsin Citizens. The population densities in the areas that most interest wind developers are much higher here in Wisconsin than in other parts of the country. Wisconsin citizens are forced to live within wind generation facilities and among industrial wind turbines to a much greater extent than those in other states. Wind development here in Wisconsin does not occur on remote hilltops or thousands of acres of empty farmland. We live in rural residential neighborhoods – communities of mostly smaller landowners.

Guidelines Based on Peer-Reviewed Science

These Guidelines are based on science. Recent peer-reviewed studies of industrial wind projects and their effect on the residents forced to live within them share a common chorus. Both audible and low frequency noise are at the heart of health issues experienced by residents. These Guidelines’ primary protection is through the use of a comprehensive noise measurement protocol and setting noise level limits that protect most people. The references provided at the end of this document provide a library of evidence that support the noise limits and the noise measurement protocol contained within these Guidelines.

Good Environmental Policy Starts with Safeguarding Wisconsin Residents

The “Wisconsin Citizens Safe Wind Siting Guidelines” put the health of the people of Wisconsin first. In order for wind development to be good for Wisconsin, it must be done responsibly and not in a fashion that sacrifices the health of those families forced to live within these wind generation facilities.

Property Rights

Many Towns and Counties have science-based ordinances that protect residents’ health and safety on their entire property. They recognize the devastating impact of noise on people and that property rights are fundamental to American ideals and need to be protected. Guidelines promulgated by the State need to protect against locating industrial wind turbines in a manner that steals the safe use and development of non-participating neighbors’ land. Past irresponsible siting of industrial wind turbines have forced families (and in some cases, their domesticated livestock) to abandon their homes to regain their health. The State wind siting guidelines need to stop the significant diminution of property values seen in other Wisconsin wind projects and ensure that most families’ largest investment is protected.

Local Control of How Wind Development is Done

Act 40 set the stage to replace local ordinances with a single homogeneous statewide rule set. Milwaukee County would be treated the same as the Niagara Escarpment in Brown County, the same as the peninsula in Door County, the same as the banks of the Mississippi in La Crosse county, and the same as the forests of northern Wisconsin. All of these areas have vastly different environments that demand local control to develop them responsibly. Never has an issue been before the State that has had the potential for such devastating effects on local Political Subdivisions, potentially forcing them to knowingly permit development in their communities that would harm the people they serve and the environment they live in. Political subdivisions must have a say in the development that occurs in their own Town or County.

Statewide Support

The coalition of groups that created this document includes property rights groups, groups protecting their communities from irresponsible wind development, and two groups whose members currently live within Wisconsin wind projects. This document is not intended to be a comprehensive set of guidelines. Rather, it attempts to address the most overlooked health, safety, and property concerns of the now suspended PSC 128 Wind Siting Rules. It also tries to protect the financial well being of Political Subdivisions, property rights of non-participating landowners, and offers direction on the steps needed to protect animals (both domestic and wildlife) and our environment. Citizens need dependable, economical, and environmentally protective sources of energy. They need to be secure in their homes - safe from intrusions of harmful sounds, disturbing shadows, and threats to their property’s value.

Thank You

Please consider using these Guidelines as a base set of requirements for permitting future wind development in Wisconsin.

Wisconsin Citizens Safe Wind Siting Guidelines

December 21, 2011 (November 27, 2011 version with minor language clarification)

Created by the following organizations:

- BCCRWE, Brown County Citizens for Responsible Wind Energy – Brown County
- CCCRE, Calumet County Citizens for Responsible Energy – Calumet County
- Concerned Citizens of Smelser & Paris Township, Grant County residents – Grant County
- Concerned Citizens of Trempealeau County – Trempealeau, Monroe, Rock, LaCrosse, and Dane counties
- Forest Voice - St Croix County
- Forward Wind Factory Victims Coalition – Fond du Lac County
- Glenmore Constitutional Coalition – Brown County
- Western Wisconsin Landowners Alliance – Monroe County
- WINDCOWS, Wisconsin Independent Citizens Opposing Wind Turbine Sites– Manitowoc & Kewaunee Counties

I	Noise Guidelines	2
II	Shadow Flicker	4
III	Wind Turbine Setback	4
IV	Real Property Value Protection	4
V	Citizen and Consumer Protection	5
VI	Site Reclamation / Decommissioning	7
VII	Electrical Pollution	9
VIII	Physical Protection	10
IX	Communications Protection.....	10
X	Groundwater Protection.....	11
XI	Wildlife/Environmental/Domestic Animal Studies and Protection	12
XII	Surveillance	12
XIII	Wind Turbine Lighting.....	13
XIV	Change of Developer/Owner/Operator	13
XV	Shared Revenue Protection.	13
XVI	Construction Inspection	13
XVII	General.....	14

I. Noise Guidelines

A. Noise Measurement Protocol

1. *Noise limits are only meaningful with a robust and repeatable noise measurement protocol. The current Public Service Commission of Wisconsin (PSC) noise measurement protocol does not ensure truly representative noise measurement results. It is incomplete, not measuring all types of wind turbine noise being experienced on Wisconsin properties. The attached protocol based on the “G. W. Kamperman and R. R. James Noise Measurement Protocol” (Appendix #1 attached to these guidelines) is accurate and repeatable and should replace the current PSC protocol for Wind Turbine noise measurement.*
2. *The turbine noise profile from the manufacturer, as well as any other inputs used by the Developer/Owner/Operator in noise calculations, shall be made available to the Political Subdivision to facilitate independent review of the modeling.*

B. Audible Sound Limit

1. *No Wind Turbine or group of Wind Turbines shall be located so as to cause an exceedance of the pre-construction/operation background sound levels by more than 5 dBA anywhere on receiving Non-Participating property(s). The background sound levels shall be the dBA L90A sound descriptor measured during a pre-construction noise study during the quietest time of the evening or night. All data recordings shall be a series of contiguous ten (10) minute measurements. L90A results are valid when L10A results are no more than 10 dBA above L90A for the same time period. Noise-sensitive sites are to be selected based on the wind development’s predicted worst-case sound emissions (in dBA and dBC), which are to be provided by the Developer/Owner/Operator. This includes the compounding effect that multiple Wind Turbines have on noise-sensitive sites.*
2. *Certain types of noise are more detrimental to some people than to others. As such, the following adjustments are to be made for compliance:*
 - a) *A 5 dB penalty is applied for tones as defined in IEC 61400-11*
 - b) *A 5 dB penalty is applied if a sound has an audible cyclic variation in sound level such as beating or other amplitude modulation.*

C. Low Frequency Sound Limit

1. *The dBC sound levels from the Wind Turbines, anywhere on the receiving Non-Participating property(s), shall not exceed the lower of either:*
 - a) *dBC less dBA L90A greater than 20, or*
 - b) *A maximum not-to-exceed sound level of 50 dBC from the Wind Turbines without other ambient sounds for properties located at one mile or more from State Highways or other major roads or 55 dBC for properties closer than one mile. These limits shall be assessed using the same nighttime and wind/weather conditions required in section I.A.1. Wind Turbine operating sound emissions (dBA and dBC) shall represent worst-case sound emissions for stable nighttime conditions with low winds at ground level and winds sufficient for full operating capacity at the Wind Turbine hub.*
2. *If computer modeling or sound testing at any time shows a difference between dBC and dBA sound level measurements that is more than 10 dB, a frequency analysis shall be performed to determine the source and nature of the low frequency sound. If the Wind Turbines are the source, the degree of impact on residents and animals shall be determined and action taken to eliminate the impact.*

D. Requirements

1. *All instruments must meet ANSI or IEC Precision integrating sound level meter performance specifications.*
2. *Procedures must meet ANSI S12.9 and other applicable ANSI standards.*
3. *Measurements must be made with the Wind Turbine(s) running with wind speed at Wind Turbine hub height sufficient to meet nominal power output or higher and at 4.5mph or below at the microphone location. Conditions should reflect the worst-case sound emissions from the Wind Energy System. This will normally involve tests taken during the evening or night when winds are calm (4.5mph or less) at the ground surface yet, at Wind Turbine hub height, sufficient to operate the Wind Turbines. Sound level measurements and meteorological conditions at the microphone shall be taken and documented.*
4. *IEC 61400-11 procedures are not suitable for enforcement of these requirements except for the presence of tones.*

E. Noise Complaint Resolution

1. *Upon receipt of a complaint by any Landowner within the project boundary or one mile outside the project boundary, a Developer/Owner/Operator shall provide the complainant with a verbal acknowledgement of receipt of the complaint within two (2) business days and a written acknowledgement and response describing the proposed solution to the complainant and Political Subdivision within five (5) business days. Within ten (10) business days of receiving a complaint, or sooner if required elsewhere, a Developer/Owner/Operator shall provide the complainant and the Political Subdivision with an explanation as to what was done to resolve the complaint or explain why it has not been resolved and what is the schedule for resolving the complaint.*
2. *If a complaint is made, the Political Subdivision shall undertake an investigation of the alleged operational violation by a qualified individual chosen by the Political Subdivision.*
3. *After the investigation, if the Political Subdivision reasonably concludes that operational violations are shown to be caused by the Wind Energy System, the Developer/Owner/Operator shall mitigate such problems on a case-by-case basis. This may include such measures as not operating during the nighttime or other noise-sensitive periods if such operation was the cause of the complaint.*
4. *A qualified acoustical consultant acceptable to the complainant and the Political Subdivision from a pre-approved list of acoustical consultants shall perform the tests.*
5. *Testing shall commence within ten (10) business days of the request. If testing cannot be initiated within ten (10) business days, the Wind Energy System(s) in question shall be shut down until the testing can be started.*
6. *A copy of the test results shall be sent to the complainant, the Political Subdivision, and the PSC within thirty (30) calendar days of test completion.*
7. *Noise Complaint Resolution Payment / Reimbursement of Fees and Costs*
 - a) *The Developer/Owner/Operator agrees to pay the Political Subdivision's actual reasonable fees and costs incurred in the preparation, negotiation, administration and enforcement of these guidelines, including, without limitation, the Political Subdivision's attorney fees, engineering and/or consultant fees, Political Subdivision meeting and hearing fees and the costs of public notices. If requested by the Political Subdivision, funds for this assessment shall be paid into an escrow account under the management of the Political Subdivision prior to the complaint investigation and payment shall be independent of the complaint investigation findings.*
 - b) *Expenses incurred by the Political Subdivision not realized prior to the start of the complaint resolution process are payable within thirty (30) calendar days of invoice. Unpaid invoices shall bear interest at the rate of 1% per month until paid. The Political Subdivision may recover all reasonable costs of collection, including attorney fees.*

II. Shadow Flicker

A. Shadow Flicker Limit

1. *Shadow flicker shall not be allowed anywhere on Non-Participating property(s) without written permission from the Non-Participating Landowner(s). Automatic shutdown devices or increased turbine setback are acceptable remedies.*

III. Wind Turbine Setback

A. Default Setback

1. *If a Wind Turbine does not exceed the above Noise and Shadow Flicker limitations, then a Wind Turbine shall be set back a minimum distance of 2,640 feet from Non-Participating property lines.*

IV. Real Property Value Protection Plan

A. Basis

1. *To assure that Non-Participating real Landowners (not lessors to the Developer/Owner/Operator) nearby the Wind Energy System Facilities are protected from negative impacts to their real property value, this Real Property Value Protection Plan is entered into and agreed to by the Developer/Owner/Operator. "Footprint" as used herein is defined as the area bounded by the most distantly separated Wind Turbines or supporting infrastructure for the Wind Energy System Facility including the electric transmission and distribution components serving the Facility whether or not owned by the Developer/Owner/Operator.*

B. Application

1. *The Developer/Owner/Operator agrees to protect the property values of all real estate within the footprint of the Wind Energy System project area and within one (1) mile of the footprint of the Wind Energy System project area. The real Landowners may elect one of the following options:*

a) *The Developer/Owner/Operator and the Landowner shall each select an independent Wisconsin-licensed appraiser, the cost of which shall be paid for by the Developer/Owner/Operator, and such appraisals are to assume that no Wind Energy System was proposed or constructed. If one of the appraisals submitted is no more than ten percent (10%) higher than the other, the appraisal values shall be averaged ("Average Appraisal Value") and the Landowner may elect to sell to the Developer/Owner/Operator at the Average Appraisal Value within thirty-six (36) months of the Wind Energy System beginning normal operation. If one of the appraisals submitted is more than ten percent (10%) higher than the other, then the two (2) independent appraisers will select a third independent Wisconsin-licensed appraiser who shall prepare and present to the Developer/Owner/Operator and Landowner his written appraisal report setting forth his opinion as to the Fair Market Value for the real property assuming that no Wind Energy System was proposed or constructed. The parties agree that appraisal of the third independent appraiser shall constitute the Appraised Fair Market Value and the Landowner may elect to sell to the Developer/Owner/Operator at the Appraised Fair Market Value, within thirty-six (36) months of the Wind Energy System beginning normal operation; or*

b) *The Developer/Owner/Operator and the Landowner shall each select an independent Wisconsin-licensed appraiser, the cost of which shall be paid for by the Developer/Owner/Operator. Each appraiser shall determine the diminution in value to the real property caused by the proximity to the Wind Turbines by determining the difference between the Fair Market Value of the real property assuming no Wind Energy System is proposed or constructed and the Fair Market Value at the time of exercising this option ("Diminution Value"). If one of the appraised diminution values submitted is no more than ten percent (10%) higher than the other, the appraised diminution values shall be averaged ("Average Diminution Value"), and the Landowner may elect to receive payment from the Developer/Owner/Operator of the Average Diminution Value. If one of the appraised diminution values submitted is more than ten percent (10%) higher than the other, then the two (2) independent appraisers will select a third independent Wisconsin-licensed appraiser who shall prepare and present to the Developer/Owner/Operator and Landowner his written appraisal report setting forth his opinion as to the Diminution Value for the real property. The parties agree that the appraised diminution value of the third independent appraiser shall constitute the Diminution Value and the Landowner may elect to receive payment from the Developer/Owner/Operator of the Diminution Value. This option must be exercised within ten (10) years of the Wind Energy System beginning normal operation.*

2. *Developer/Owner/Operator agrees to protect the property values of all real estate located between one (1) mile and two (2) miles of the Wind Energy System footprint boundary. The Developer/Owner/Operator and the Landowner shall each select an independent Wisconsin-licensed appraiser, the cost of which shall be paid for by the Developer/Owner/Operator. Each appraiser shall determine the diminution in value to the real property caused by the proximity to the Wind Turbines by determining the difference between the Fair Market Value of the real property assuming no Wind Energy System is proposed or constructed and the Fair Market Value at the time of exercising this option ("Diminution Value"). If one of the appraised diminution values submitted is no more than ten percent (10%) higher than the other, the appraised diminution values shall be averaged ("Average Diminution Value"), and the Landowner may elect to receive payment from the Developer/Owner/Operator of the Average Diminution Value. If one of the appraised diminution values submitted is more than ten percent (10%) higher than the other, then the two (2) independent appraisers will select a third independent Wisconsin-licensed appraiser who shall prepare and present to the Developer/Owner/Operator and Landowner his written appraisal report setting forth his opinion as to the Diminution Value for the real property. The parties agree that the appraised diminution value of the third independent appraiser shall constitute the Diminution Value and the Landowner may elect to receive payment from the Developer/Owner/Operator of the Diminution Value. This option must be exercised within ten (10) years of the Wind Energy System beginning normal operation.*

V. Citizen and Consumer Protection

A. Pre-Solicitation Public Hearing

1. *At least six (6) months before a Developer/Owner/Operator begins soliciting any lease, easement, or waiver agreements for any Wind Energy System Facility, the Developer/Owner/Operator shall request, at the Developer/Owner/Operator's expense, a pre-solicitation public hearing(s) with the Political Subdivision(s), at which no official action shall be taken. Notice of the public hearing(s) shall be sent to all Landowners within the proposed boundary and within two (2) miles of the proposed boundary of the Wind Energy System Facility, which may include properties in adjoining Political Subdivision(s). Political Subdivision(s) shall schedule such public hearing(s) and provide notice of the public hearing(s). Additionally, the Developer/Owner/Operator shall send notice of the public hearing(s) to Landowners at least ninety (90) calendar days prior to the date of the public hearing(s). The Developer/Owner/Operator shall send these notices via certified mail, return receipt requested, and shall provide proof of notice to the Political Subdivision(s) with a certificate of mailing for each Landowner. A pre-Application public hearing(s) shall be held in order for the Developer/Owner/Operator to accomplish the following:*

a) *Inform Political Subdivision residents of the proposed project and provide answers to residents with questions. Political subdivision residents who are not able to attend the meeting shall have the option to provide written comments or questions to the Developer/Owner/Operator and/or Political Subdivision for which they will receive a written response within ten (10) business days. A written summary of questions, comments and responses shall be sent to all landowners noticed in V.A.1.*

b) *Provide informational displays showing the areas of the Political Subdivision that meet the provisions of the Political Subdivision's ordinance and are likely locations for any part of a Wind Energy System Facility. Projected type, size, quantity, and positive/negative impacts of the proposed facilities will be shown. These displays shall be present and accessible within the political subdivision boundaries during business hours for two (2) weeks prior to the hearings, during the hearings at the location of the hearings, and remain in place and accessible within the political subdivision boundaries during business hours for two (2) weeks after the hearings.*

B. Pre-Application Notice

1. *At least ninety (90) calendar days before a Developer/Owner/Operator files an Application to construct a Wind Energy System, a Developer/Owner/Operator shall provide written notice of the planned Wind Energy System with a project description and construction timeline to all interested parties, including all Landowners within two (2) miles of any part of the proposed Wind Energy System Facility. If the Developer/Owner/Operator does not contact each party directly but instead sends the notice by mail, the Developer/Owner/Operator shall provide the Political Subdivision with a certificate of mailing for each party.*

C. Recusal of Conflicted Public Official

1. *All Political Subdivision officials shall publicly disclose in writing at the next scheduled public meeting of the Political Subdivision any contact between a wind Developer/Owner/Operator and himself/herself or any member of his/her immediate family. This disclosure shall be included in the Political Subdivision's official public record. Should a Political Subdivision official sign a contract with a wind Developer/Owner/Operator or discover the potential for any payment or other compensation related to the proximity of a Wind Turbine to his or her property, or any potential contract, payment, or other compensation to an immediate family member, said official shall publicly disclose such potential conflict of interest and recuse himself or herself from any discussions or decisions pertaining to potential wind energy development within the Political Subdivision (based on §19.59, Wisconsin Statutes). Failure of a Political Subdivision official to disclose any financial conflict and recuse himself/herself will result in potential criminal action by the District Attorney and civil action by the Political Subdivision and/or residents against the conflicted public official.*

D. Informational Brochure

1. *Require informational brochure created by the PSC for Landowners that has been prepared through input from all interested parties including, but not limited to, Political Subdivisions, developers, and current Wisconsin wind project residents.*

2. *The brochure shall include the positive and negative aspects and impacts of industrial Wind Energy System Facilities on rural communities, including all possible adverse physiological and psychological health effects on humans, wildlife, domestic and farm animals, as well as any possible adverse societal and economic impacts, including reduced well-being, degraded living conditions, and reduced property values.*

3. *All Political Subdivisions and applicable Developer/Owner/Operator(s) will be provided with copies of this brochure prior to the effective date of the Wind Siting Rules. Political Subdivisions shall give public notice of such brochure and that it is available for residents to inspect or receive.*

4. *The Developer/Owner/Operator(s) shall be required to provide the brochure to Landowners at least two (2) weeks before negotiating or accepting a lease, waiver, or easement. If the Developer/Owner/Operator fails to provide the brochure, any lease, waiver, or easement signed by a Landowner shall be null and void.*

E. Cooling Off Period

1. *Establish a cooling off period of five (5) business days for a Landowner to rescind a signed lease, waiver, or easement.*

F. Wind Access Agreements

1. *Developer/Owner/Operator shall provide evidence (a signed statement from the Developer/Owner/Operator and countersigned by the Landowner) that the Developer/Owner/Operator has negotiated with adjacent Landowners and has obtained written agreements with all Landowners whose Wind Rights may be affected by the Wind Energy System or who could otherwise potentially interfere with the Developer/Owner/Operator's wind access.*

G. No Loss of Rights or Protections for any form of Mitigation

1. *Whether for signal interference, electrical pollution/stray voltage, wind access agreements, or any other action taken by a Developer/Owner/Operator to mitigate problems or to make a Non-Participating Landowner whole, there shall be no loss of rights or protections by the Non-Participating Landowner, nor shall such party be restrained by any contractual restriction of speech. Although adversely affected by the project, such persons are not willing participants of the project and are not to be classified as Participating Landowners because of any compensation for losses sustained.*

VI. Site Reclamation / Decommissioning

A. Application Requirements for Decommissioning / Site Reclamation:

1. *Upon Application for the permit to build any part of the Wind Energy System Facility within the jurisdiction of a Political Subdivision, the Developer/Owner/Operator shall submit:*

a) *An Abandonment, Removal, and Site Restoration Plan: The plan shall identify the specific properties to which it applies and shall indicate the timeline and process to be used for removal of Wind Energy System Facility components as required in Section VI.B.1. The plan shall also include, but not be limited to, road repair costs and all re-grading and re-vegetation necessary to return the subject property to the condition existing prior to establishment of the Wind Energy System. The plan shall reflect the site-specific character including topography, vegetation, drinking water protection, drainage, and any unique environmental features at the site. The plan shall reflect any standards set forth in these guidelines.*

b) *Itemized Cost Estimate: The above plan shall include an independent Wisconsin-licensed Professional Engineer certified estimate of the total cost (by component) of implementing the "Abandonment, Removal, and Site Restoration Plan". Political Subdivision must approve selection of, and be given the opportunity to provide input to, the Developer/Owner/Operator contracted engineer.*

2. *A condition of approval of any Application shall be an advanced payment for removal, site reclamation, and restoration of all components of the Wind Energy System Facility. This advance payment shall be placed in a joint escrow account or surety bond (at the discretion of and for the benefit of the Political Subdivision), the amount to be determined by the Political Subdivision. Said amount shall be sufficient for removal, site reclamation, and restoration of Wind Energy System Facility as itemized in the "Abandonment, Removal, and Site Restoration Plan" in Section VI.A.1. Such financial security shall be kept in full force and effect during the entire time the Wind Energy System Facility exists. The financial security shall be irrevocable and non-cancelable until such time as the Political Subdivision certifies that reclamation and restoration are complete and grants a release of obligation. The Political Subdivision may require an annual escalator or increase based on current reclamation costs.*

3. *Participating Landowner is Party of Last Resort for decommissioning. As such, the Participating Landowner shall place ten (10) percent of the monetary value of all compensation (monetary or otherwise) received from any party for hosting any Wind Energy System Facility (or any consideration received from a land use/lease agreement for a Wind Energy System) in a Participating Landowner Fund in the form of a joint escrow account or surety bond (at the discretion of and for the benefit of the Political Subdivision). These funds shall be used if any financial liability is incurred by the Political Subdivision in the Decommissioning or Site Reclamation of any part of the Wind Energy System. Application shall include a signed statement by the underlying Participating Landowner(s) acknowledging that the Landowner(s) will be financially responsible if the Developer/Owner/Operator fails to reclaim the site as required or if costs exceed the amount spelled out above in section VI.A.2 Any removal and reclamation costs incurred by the Political Subdivision shall become a lien on the Participating Landowner's real estate and other property and may be collected from the Landowner(s) in the same manner as property taxes. Once the Political Subdivision certifies that reclamation and restoration are complete and grants a release of obligation to the Developer/Owner/Operator and Participating Landowner, any remaining funds in this Participating Landowner Fund shall be released to the Participating Landowner.*

B. Process of Decommissioning / Site Reclamation:

1. *Any Wind Energy System that does not produce energy, or a component that is no longer needed for energy production, for a continuous period of twelve (12) months, excluding reasonable time spent on repairs or improvements, shall be considered abandoned and shall be decommissioned in accord with the decommissioning provisions that follow.*

a) *Removal of all required Wind Energy System Facilities and appurtenances shall be removed from the site within seven (7) calendar months of the date of receipt of a use termination notice to the Political Subdivision by the Developer/Owner/Operator of the facility or its assigns (or the date of abandonment as described above). Wind Energy System Facilities removal and site reclamation include:*

(1) All above ground Wind Energy System Facilities shall be removed. The ground shall be restored, stabilized, graded, and cleared of any debris by the Developer/Owner/Operator of the facility or its assigns. If site is not to be used for agricultural practices following removal, site shall be seeded to prevent soil erosion.

(2) Wind Turbine foundations and other infrastructure foundations shall be removed to a minimum depth of eight (8) feet below grade, or to the level of the bedrock if less than eight (8) feet below grade, by the Developer/Owner/Operator of the facility or its assigns. Following removal, the location of any remaining Wind Energy System Facilities' foundations or infrastructure shall be identified on a map as such and recorded with the deed to the property with the County Register of Deeds.

(3) To reduce the possibility of leaving contamination conduits to drinking water, the Political Subdivision may, at their discretion, require that the Developer/Owner/Operator completely remove all underground Wind Energy System Facilities including, but not limited to, underground cabling and foundations (limited to the level of bedrock if resting on or constructed into bedrock), that lie within or pass within 500 feet of a karst feature or pathway to groundwater. These karst features and pathways to groundwater are to include those documented prior to construction and those discovered during or after construction of the Wind Energy System.

(4) Upon abandonment of underground cables that do not lie within 500 feet of a karst feature, locations where cables were severed or disconnected from above ground facilities shall be sealed in a way approved by the Political Subdivision to prevent migration of storm water / agricultural runoff or contaminates into the cable trench areas.

(5) Any access roads shall be removed, cleared, and graded by the Developer/Owner/Operator of the Wind Energy System or its assigns at the Developer/Owner/Operator's expense, unless the Participating Property Landowner wants to keep the access road. It will not be assumed that the Political Subdivision will take ownership of any access road unless through official action of the Political Subdivision.

- b) *Decommissioning shall conform to the contract between Participating Property Landowner and the Developer/Owner/Operator of the Wind Energy System, subject to the requirements set forth in these guidelines and those of the Political Subdivision.*

VII. Electrical Pollution

A. Wiring Requirements

1. *All wiring between Wind Turbines and the Wind Energy Facility substation shall be underground. All neutral grounding connectors from commercial Wind Turbines shall be insulated from the earth and shall be sized to accommodate at least twice the peak load of the highest phase conductor, to absolutely prevent transient ground currents, in order to comply with the National Electric Safety Code and the IEEE Standard 519-1992, approved by the American National Standards Institute.*
2. *Grounding of both the electrical transmission lines and the supply lines to the internal electrical systems of the Wind Turbines themselves, shall comply with IEEE Standard 519-1992 Rule 92D, Current in Ground Conductors: "Ground connector shall be so arranged that under normal circumstances, there will be no objectionable flow of current over the grounding conductor."*
3. *IEEE Standard 519-1992 Rule 215B: [It is not permissible] "to use the earth as a part of a supply circuit."*
4. *Under no circumstances shall any Wind Turbine be connected directly to the grid; connection must be made through a substation or transformer properly grounded and filtered to keep harmonic distortion within recommended limits. To avoid health issues for those living in proximity to Wind Turbines, inverters need to be properly filtered at each Wind Turbine to eliminate electrical pollution.*
5. *Bare, concentric neutrals are specifically prohibited in buried lines between Wind Turbines and in underground transmission lines to substations.*
6. *The Developer/Owner/Operator must perform two pre-construction electrical pollution tests on all livestock facilities within the project boundary and one mile radius beyond the project boundary. The tests shall be performed by a mutually accepted voltage investigator, once in the spring and once in the fall. The tests shall be performed according to PSC Phase II Stray Voltage Testing Protocol. A copy of the test results shall be sent via certified mail to each Landowner tested.*
7. *The Developer/Owner/Operator shall receive written permission from Landowners prior to electrical pollution testing. It shall be made clear in writing that when permission is denied, all responsibility for electrical pollution remains with the Landowner. This release of responsibility must be received in writing.*
8. *A fifteen (15) business day notice shall be provided in writing to the Landowner for the mutually agreed upon testing time. The Developer/Owner/Operator shall work with the Landowner to schedule a mutually agreeable time for testing.*
9. *The Developer/Owner/Operator must submit detailed electrical schematics of proposed project to any Landowners within the project area and one mile beyond upon request.*
10. *Upon a complaint and evidence of the potential for electrical pollution, the Developer/Owner/Operator shall arrange additional electrical pollution testing by a mutually accepted voltage investigator.*

VIII. Physical Protection

A. Blade and Debris Throw

1. *The Developer/Owner/Operator shall ensure that the blades or debris (including ice) from the blades of a Wind Turbine do not impact anywhere on a Non-Participating Landowner's property.*

B. Blade Throw Calculations

1. *The Developer/Owner/Operator shall provide a report from the Wind Turbine Manufacturer that calculates the maximum distance pieces of the Wind Turbine blades could be thrown during an abnormal event such as Wind Turbine overspeed. The basis of the calculation and all assumptions must be disclosed. The report shall be reviewed by an independent Wisconsin-licensed Professional Engineer with expertise in mechanical design selected by the Political Subdivision at the Developer/Owner/Operator's expense prior to review and approval of the Application. If the report indicates blade throw exceeds the setback, the setback will be increased.*

C. Debris Throw Calculations

1. *The Developer/Owner/Operator shall provide a report from the Wind Turbine Manufacturer that calculates the maximum distance that debris from the Wind Turbine blades could be thrown at normal operating speeds. The basis of the calculation and all assumptions must be disclosed. The report shall be reviewed by an independent Wisconsin-licensed Professional Engineer with expertise in mechanical design selected by the Political Subdivision at the Developer/Owner/Operator's expense, prior to review and approval of the Application. If the report indicates blade debris throw exceeds the setback, the setback will be increased.*

IX. Communications Protection

A. Signal Interference

1. *All Wind Energy System Facilities shall be sited and operated so they do not interfere with commercial, personal and governmental communications including, but not limited to, telephone (including cellular and digital), standard digital TV (antenna), microwave, satellite (dish), navigational, weather forecasting facilities, internet, broadband or radio communications and reception to and from neighboring areas.*

2. *No part of the Wind Energy System Facility shall interfere with any future electromagnetic communications and technological media for home and business operations.*

3. *The Developer/Owner/Operator shall be responsible for the full cost of any remediation necessary to provide equivalent or better alternate service or to correct any problems. Remediation shall continue for the life of the project regardless of any change of Developer/Owner/Operator. The Developer/Owner/Operator shall use the latest technology as it becomes available in situations where remediation still had some residual negative impacts. Should remediation not be completed within five (5) business days after the Developer/Owner/Operator receives notice of the interference, the Developer/Owner/Operator shall be required to cease operations until remediation is completed.*

4. *If the interference is adversely affecting emergency communications, the Developer/Owner/Operator shall immediately eliminate the interference or cease operations.*

5. *The Developer/Owner/Operator of a Wind Energy System shall provide a pre-construction critical communications study prepared by an independent Wisconsin-licensed Professional Engineer, selected by the Political Subdivision at the Developer/Owner/Operator's expense. If the study shows that the components of the proposed Wind Energy System Facility will interfere with emergency (fire, police/sheriff, ambulance), radio, two-way communications (base stations, mobile, hand-held radios, including digital), paging, broadband, standard digital TV (antenna), telephone (including cellular and digital), microwave, satellite (dish), navigational, weather forecasting facilities, internet or radio communications and reception to and from neighboring areas, the design shall be modified to eliminate interference. The Political Subdivision may modify this list in order to encompass all future electromagnetic communications and technological media for home and business operations.*

6. *If the Developer/Owner/Operator is a public utility, Administrative Code PSC 113.0707 also applies.*

X. Groundwater Protection

A. Groundwater Impact Study

1. *The Developer/Owner/Operator shall provide an environmental study specifically indicating the impact the project will have on the groundwater beneath and in the vicinity of the proposed Wind Turbine sites and at cable trenches passing through groundwater-sensitive areas. If a Wind Turbine foundation is proposed in a bedrock or karst area, a baseline of all wells and certified public drinking sources within a half-mile radius shall be established and provided to the Political Subdivision as part of the Application. The study shall be prepared by a qualified person on behalf of the Developer/Owner/Operator, and shall be reviewed and approved by an independent consultant selected by the Political Subdivision, at the Developer/Owner/Operator's expense, prior to review and approval of the Application.*

B. Well Testing

1. *At the request of the Political Subdivision, the Developer/Owner/Operator of the Wind Energy System may be required to run water tests on wells where any Wind Energy System Facilities (such as, but not limited to, foundations and cable trenches) will be located, both prior to and after construction of the Wind Energy System. The Political Subdivision will determine the time periods when the testing will take place.*

2. *The Political Subdivision will determine how large the test area needs to be based on factors such as where bedrock or karst features are located. The State Board of Health has recommended well testing be done within one mile of pathways which include excavations within 24 inches of bedrock.*

3. *The Political Subdivision may hire a consultant to develop and oversee the testing process. Testing will be performed by a third-party mutually agreed upon by the Political Subdivision and the Developer/Owner/Operator at mutually agreed upon times. Any associated costs to the Political Subdivision shall be reimbursed by the Developer/Owner/Operator.*

4. *If a Political Subdivision chooses not to undertake management of well testing, individual Landowners reserve the right to require the Developer/Owner/Operator to test their private wells prior to and after construction at the Developer/Owner/Operator's expense. Testing will be performed by a third-party mutually agreed upon by the Landowner and the Developer/Owner/Operator at mutually agreed upon times.*

5. *The Developer/Owner/Operator of the Wind Energy System shall be financially responsible for any costs associated with the testing of wells and for any contamination to wells that tested acceptable prior to construction but are not acceptable after construction.*

XI. Wildlife/Environmental/Domestic Animal Studies and Protection

A. Jurisdiction

Act 40 required the Wisconsin Department of Natural Resources (DNR) to report to the Legislature regarding whether its existing authorities are adequate to protect wildlife and habitat from negative impacts of industrial wind projects, and propose any changes needed to provide adequate authority. The DNR issued this report on November 12, 2010 and is available on the DNR's website (<http://dnr.wi.gov/org/es/science/energy/wind/MarchantFullerLetter.pdf>).

In this report, the DNR describes the gaps in jurisdiction affecting their ability to carry out their duty to protect Wisconsin's rich environment and wildlife. The DNR describes the needed legislation to give them the authority to properly regulate industrial wind projects. "Voluntary Guidelines" given to developers with large financial interest in wind development are simply inadequate when it comes to protecting birds, bats, and our environment in general. A case in point was the Shirley Wind project in Glenmore, Wisconsin built in 2010. This generation facility included eight of the largest wind turbines ever built in Wisconsin (approximately 500 feet tall). This development being on the Niagara Escarpment, a natural migratory flyway, known for its healthy bat population, and rich natural resources that should be protected. Residents in Brown County called for the DNR to perform an environmental impact assessment before this project was to be built, but were simply told that the DNR's authority was limited to "requesting" that the developer perform such a study. Without the DNR having the authority to require an independent study, we will never know the environmental cost of this project or others that came before it. There needs to be regulation and/or legislation to fill these gaps in authority.

What is lacking in Act 40, the PSC128 rule set, and the DNR's report is protection for the domestic animals that are an integral part of the \$38.8 billion agricultural economy of Wisconsin (source: University of Wisconsin Extension-2009 study). Both Participating and Non Participating Farmers have suffered from the adverse effects of wind development in Wisconsin. The backbone of our State's economy must be protected.

Prior to additional industrial wind development, care needs to be taken to ensure that the DNR has the authority to require impact studies prior to building generation facilities with lifespans of decades. These studies can help ensure that these generation plants will serve the environmental interests of Wisconsin today and for years to come. These should include an environmental benefit and risk analysis - requiring the real world analysis of the amount of fossil fuel that would be displaced by the proposed project (the stated driving force for industrial wind development). This needs to be based on wind generation statistics and actual fossil fuel savings analysis of existing industrial wind projects in Wisconsin. The costs to wildlife need to be itemized and represent those species protected today and those that are facing increasing environmental pressure (for example - white nose syndrome in our bat population). Domestic animals must be protected. To continue blindly favoring this type of generation over other renewable resources without accurately studying its social benefit and costs is to gamble our environmental heritage in Wisconsin.

XII. Surveillance

A. Monitoring Rules

1. Wind Turbines in Wisconsin are often constructed in rural residential areas and as such the privacy of Non-Participating Landowners must be protected:

a) Security and surveillance devices mounted on or aimed at the Wind Turbines or any project infrastructure shall (as a matter of normal operations) have only a range that includes the Participating Landowner's land.

b) Recordings of any kind inadvertently captured of any Non-Participating property are considered to be the property of the Non-Participating Landowner.

c) Upon discovery of these recordings by the Developer/Owner/Operator personnel, the original media as well as any backup copies will be turned over to the Non-Participating Landowner along with an explanation of the process that has been implemented to prevent recurrence of this invasion of privacy.

XIII. Wind Turbine Lighting

A. Lighting Requirements

1. *No component of the Wind Energy System Facility shall be artificially lighted, except to the extent required by the Federal Aviation Administration's (FAA) minimum standards using red lights, if possible. Lighting shall be shielded from ground view to the maximum extent allowed by FAA standards. Technology, which turns on lighting only when aircraft approach the area, shall be used by the Developer/Owner/Operator unless specifically not permitted by the FAA.*

XIV. Change of Developer/Owner/Operator

A. Developer/Owner/Operator Requirements

1. *Change of ownership shall not be valid until the new Developer/Owner/Operator has shown proof of compliance with all specific requirements of the original Developer/Owner/Operator. Requirements include, but are not limited to, general liability, financial assurance for decommissioning and an escrow account for road repairs.*

XV. Shared Revenue Protection

A. Guidelines

1. *The Developer/Owner/Operator shall enter in to a Joint Development Agreement (JDA) with the Political Subdivision(s) in which any part of the Wind Energy System Facility is to be built. This JDA shall include a contracted amount of revenue to be paid to the hosting Political Subdivision for its involvement in the Wind Energy System that will include any legislated shared revenue payment and any additional consideration agreed upon by the Political Subdivision and the Developer/Owner/Operator. In the event that the Wind Energy System JDA payments to the Political Subdivision are decreased by any legislative or regulatory action, the Developer/Owner/Operator shall be required to pay the Political Subdivision an amount not less than the contracted amount spelled out in the JDA that included the shared revenue payment from the State or regulatory agency. Such payments shall be on an annual basis and payable on the 180th day after notice from the Political Subdivision of the Developer/Owner/Operator's obligation to pay under this paragraph.*

2. *Any State shared revenue payments referenced in the JDA are to be paid directly to the Political Subdivision, not the Developer/Owner/Operator, by the State of Wisconsin. Regardless, the Developer/Owner/Operator shall be required to supplement the Political Subdivision's annual Wind Energy System JDA payments actually received, by an amount equal to the annual percentage change of the Consumer Price Index as of January 1st of each calendar year beginning on the first January following the date the Political Subdivision receives its first payment. For purposes of this escalator clause, the Consumer Price Index means the U.S. Department of Labor, Bureau Statistics, Consumer Price Index for the United States, All Urban Consumers, all items, unadjusted tax index.*

XVI. Construction Inspection

A. Third-Party Inspector During Construction

1. *The Developer/Owner/Operator will pay a reasonable fee for a third-party inspector chosen by the Political Subdivision to monitor and report to the Political Subdivision regarding the Developer/Owner/Operator's compliance with permit requirements during construction. An inspector monitoring compliance under this subsection shall also report to all State authorities charged with responsibilities for permitting and inspecting Wind Energy Systems.*

XVII. General

A. Applicability

1. *"Small Wind Electric Systems - A Wisconsin Consumer's Guide" was produced for the U.S. Department of Energy by the National Renewable Energy Laboratory, a DOE national laboratory. In it, this publication states that Wind Turbines for residential applications (or Small Wind Energy Systems) can range up to 100 kilowatts. These residential scale Wind Turbines are not the focus of our guidelines. As such, these "Wisconsin Citizens Safe Wind Siting Guidelines" shall only apply to an individual Wind Turbine that has an installed nameplate capacity of more than 100 kilowatts or any Wind Energy System consisting of multiple Wind Turbines with a combined installed nameplate capacity of more than 100 kilowatts.*

B. Participation in State Wind Studies

1. *The Developer/Owner/Operator shall cooperate with any study of the effects of Wind Energy Systems coordinated by any State agency.*

C. Wind Siting Council Membership

1. *To ensure transparency in the process of altering, modifying, or recreating the wind siting guidelines by the existing or any future PSC Wind Siting Council, require that members complete GAB Form "Statement of Economic Interests" (http://gab.wi.gov/sites/default/files/gab_forms/1/eth1for2011answerblanklines_pdf_20656.pdf). These Statements of Economic Interests are open for public inspection.*

2. *If the Wind Siting Council is to revisit PSC128 or another statewide wind siting rule set, the concerns itemized in Appendix E of the PSC's "Wind Siting Council Final Report" (<http://psc.wi.gov/mediaRoom/documents/WSC%20Final%20Report%20and%20Cover%20Letter%208-9-2010.pdf>) shall be studied and addressed (possibly through the expansion or reconstitution of the Wind Siting Council membership at the PSC Chairman's discretion).*

Appendix #1 - Wisconsin Citizens Safe Wind Siting Guidelines

Noise Measurement Protocol

(a) Introduction

The potential impact of sound and sound-induced building vibration associated with the operation of wind-powered electric generators is often a primary concern for citizens living near proposed wind energy systems (WES(s)). This is especially true of projects located near homes, residential neighborhoods, businesses, schools, and hospitals in quiet residential and rural communities. Determining the likely sound and vibration impacts is a highly technical undertaking and requires a serious effort in order to collect reliable and meaningful data for both the public and decision makers.

This protocol is based in part on criteria published in American National Standards S12.9 - Quantities and Procedures for Description and Measurement of Environmental Sound, and S12.18 for the measurement of sound pressure level outdoors.

The purpose is to first, establish a consistent and scientifically sound procedure for evaluating existing background levels of audible and low frequency sound in a WES project area, and second to use the information provided by the Applicant in its application showing the predicted over-all sound levels in terms of dBA and dBC¹ as part of the required information submitted with the application.

These values shall be presented as overlays to the applicant's iso-level plot plan graphics (dBA and dBC) and in tabular form with location information sufficient to permit comparison of the baseline results to the predicted levels. This comparison will use the level limits of the ordinance to determine the likely impact operation of a new wind energy system project will have on the existing community soundscape. If the comparison demonstrates that the WES project will not exceed any of the level limits, the project will be considered to be within allowable limits for safety and health. If the Applicant submits only partial information required for this comparison the application cannot be approved. In all cases the burden to establish the operation as meeting safety and health limits will be on the Applicant.

Next, the protocol addresses requirements for the sound propagation model to be supplied with the application.

¹ Calculated from one-third octave band sound power levels (LW per IEC 61400-11) provided by the wind turbine manufacturer covering the frequency range from 6.3 Hz to 10,000 HZ or higher.

Finally, if the project is approved, this Appendix covers the study needed to compare the post-build sound levels to the predictions and the baseline study. The level limits in the ordinance apply to the post-build study. In addition, if there have been any complaints about WES sound or low frequency noise emissions by any resident of an occupied dwelling, that property will be included in the post-build study for evaluation against the rules for sound level limits and compliance.

The characteristics of the proposed WES project and the features of the surrounding environment will influence the design of the sound and vibration study. Site layout, types of WES(s) selected and the existence of other significant local audible and low frequency sound sources and sensitive receptors should be taken into consideration when designing a sound and vibration study. The work will be performed by an independent qualified acoustical consultant for both the pre-construction background and post-construction sound studies as described in the body of the ordinance.

(b) Instrumentation

All instruments and other tools used to measure audible, inaudible and low frequency sound shall meet the requirements for ANSI or IEC Type 1 Integrating Averaging Sound Level Meter with one-third octave band analyzer with frequency range from 6.3 Hz to 20k Hz and capability to simultaneously measure dBA LN and dBC LN. The instrument must also be capable of measuring low level background sounds down to 20 dBA. Measurements shall only be made with the instrument manufacturer's approved wind screen. A compatible acoustic field calibrator is required with certified ± 0.2 dB accuracy. Portable meteorological measurement requirements are outlined in ANSI S12.9 Part 3 and are required to be located within 5m of the sound measuring microphone. The microphone shall be located at a height of 1.2 to 1.5 meters for all tests unless circumstances require a different measurement position. In that case, the reasons shall be documented and include any adjustments needed to make the results correspond to the preferred measurement location.

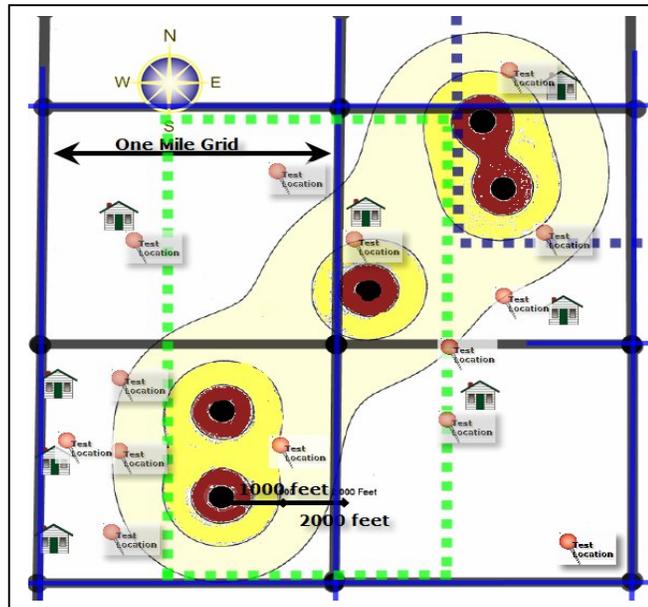
(c) Measurement of Pre-Construction Sound Environment (Base-lines)

An assessment of the proposed WES project area's existing sound environment is necessary in order to predict the likely impact resulting from a proposed project. The following guidelines must be used in developing a reasonable estimate of an area's existing background sound environment. All testing is to be performed by an independent qualified acoustical consultant approved by the Political Subdivision. The WES applicant may file objections detailing any concerns it may have with the Political Subdivision's selection. These concerns will be addressed in the study. Objections must be filed prior to the start of the noise study. All measurements are to be conducted with ANSI or IEC Type 1 certified and calibrated test equipment per reference specification at the end of this Appendix. Test results will be reported to the Political Subdivision or its appointed representative.

1. **Sites with No Existing Wind Energy Systems (Base-line Sound Study)**

Sound level measurements shall be taken as follows:

The results of the model showing the predicted worst case dBA and dBC sound emissions of the proposed WES project will be overlaid on a map (or separate dBA and dBC maps) of the project area. An example (right) shows an approximately two (2) mile square section with iso-level contour lines prepared by the applicant, sensitive receptors (homes) and locations selected for the baseline dBA and dBC sound tests whichever are the controlling metric. The test points shall be located at the property line bounding the property of the turbine's host closest to the wind turbine, or a location on the non-participating property where the sound is anticipated to be the highest. Additional sites may be added if landowner and applicant cannot agree upon a single location. A grid comprised of one (1) mile boundaries (each grid cell is one (1) square mile) should be used to assist in identifying between two (2) to ten (10) measurement points per cell. The grid shall extend to a minimum of one (1) mile beyond the perimeter of the project boundary. This may be extended to more than one mile at the discretion of the Political Subdivision. The measurement points shall be selected to represent the noise sensitive receptor sites based on the anticipated sound propagation from the combined Industrial Wind Turbine Installation (WTi) in the project. Usually, this will be the closest WTi. If there is more than one WTi near-by then more than one test site may be required.



The intent is to anticipate the locations on non-participating property that will receive the highest sound emissions. The site that will be most likely negatively affected by the WES project's sound emissions should be given first priority in testing. These sites may include sites adjacent to occupied dwellings or other noise sensitive receptor sites. Sites shall be selected to represent the locations where the background soundscapes reflect the quietest locations of the sensitive receptor sites. Background sound levels (and one-third octave band sound pressure levels for the sound measuring consultants file) shall be obtained according to the definitions and procedures provided in the ordinance and recognized acoustical testing practice and standards.

All properties within the proposed WES project boundaries will be considered for this study.

One test shall be conducted during the period defined by the months of April through November with the preferred time being the months of June through August. These

months are normally associated with more contact with the outdoors and when homes may have open windows during the evening and night. Unless directed otherwise by the Political Subdivision, the season chosen for testing will represent the background soundscape for other seasons. At the discretion of the Political Subdivision, tests may be scheduled for other seasons.

All measurement points (MPs) shall be located with assistance from the Political Subdivision staff and property owner(s) and positioned such that no significant obstruction (building, trees, etc.) blocks sound and vibration from the nearest proposed WES site. Duration of measurements shall be a minimum of ten continuous minutes for each criterion at each location. The duration must include at least 6 minutes that are not affected by transient sounds from near-by and non-nature sources. Multiple 10 minute samples over longer periods such as 30 minutes or one (1) hour may be used to improve the reliability of the L90 values. The ten minute sample with the lowest valid L90 values will be used to define the background sound.

The tests at each site selected for this study shall be taken during the expected 'quietest period of the day or night' as appropriate for the site. For the purpose of determining background sound characteristics, the preferred testing time is from 10 pm until 4 am. If circumstances indicated that a different time of the day should be sampled, the test may be conducted at the alternate time if approved by the Political Subdivision.

Sound level measurements must be made on a weekday of a non-holiday week. Weekend measurements may be taken at selected sites where there are weekend activities that may be affected by WTi sound.

Measurements must be taken at 1.2 to 1.5 meters above the ground and at least 15 feet from any reflective surface following ANSI 12.9 Part 3 protocol including selected options and other requirements outlined later in this Section.

a. *Reporting*

(1) For each Measurement Point and for each measurement period, provide each of the following measurements:

- (a) LAeq, L10, and L90, in dBA
- (b) LCeq, L10, and L90, in dBC

(2) A narrative description of any intermittent sounds registered during each measurement. This may be augmented with video and audio recordings.

(3) A narrative description of the steady sounds that form the background soundscape. This may be augmented with video and audio recordings.

b. Wind speed and direction at the Measurement Point, humidity and temperature at time of measurement will be included in the

documentation. Corresponding information from the nearest 10 meter weather reporting station shall also be obtained.

Measurements taken when wind speeds exceed 2m/s (4.5 mph) at the microphone location will not be considered valid for this study. A windscreen of the type recommended by the monitoring instrument's manufacturer must be used for all data collection.

- (1) Provide a map and/or diagram clearly showing (using plot plan provided by Political Subdivision or Applicant):
 - The layout of the project area, including topography, the project boundary lines, and property lines.
 - The locations of the Measurement Points.
 - The minimum and maximum distance between any Measurement Points.
 - The location of significant local non-WES sound and vibration sources.
 - The distance between all MPs and significant local sound sources. And,
 - The location of all sensitive receptors including but not limited to: schools, day-care centers, hospitals, residences, residential neighborhoods, places of worship, and elderly care facilities.

2. **Sites with Existing Wind Energy Systems**

Two complete sets of sound level measurements must be taken as defined below:

- a. One set of measurements with the wind generator(s) off unless the Political Subdivision elects to substitute the sound data collected for the background sound study collected as part of an earlier baseline study. Wind speeds must be suitable for background testing.
- b. One set of measurements with the wind generator(s) running with wind speed at hub height sufficient to meet nominal power output or higher and at 2 m/s or below at the microphone location. Conditions should reflect the worst case sound emissions from the WES project. This will normally involve tests taken during the evening or night when winds are calm (2m/sec or less) at the ground surface yet, at hub height, sufficient to operate the turbines.

Sound level measurements and meteorological conditions at the microphone shall be taken and documented as discussed above.

3. **Sound Level Estimate for Proposed Wind Energy Systems (when adding more WTi to existing project)**

In order to estimate the sound impact of the proposed WES project on the existing environment, an estimate of the sound produced by the proposed WES(s) under worst-case conditions for producing sound emissions must be provided.

The WES operator shall provide the qualifications of the firm along with details of the procedure that will be used, software applications, and any limitations to the software or prediction methods. The WES operator shall provide input as to their recommended firm, but the Political Subdivision shall have final say in the firm chosen.

Provide the manufacturer's sound power level (L_w) characteristics for the proposed WES(s) operating at full load utilizing the methodology in IEC 61400-11 Wind Turbine Noise Standard. Provide one-third octave band L_w sound power level information from 6.3 Hz to 10k Hz. Furnish the data with and without A-weighting. Provide sound pressure levels predicted for the WES(s) in combination and at full operation and at maximum sound power output for all areas where the predictions indicate dBA levels of 30 dBA and above. The same area shall be used for reporting the predicted dBC levels. Contour lines shall be in increments of 5 dB.

Present tables with the predicted sound levels for the proposed WES(s) in dBA, dBC and at all octave band centers (8 Hz to 10k Hz) for distances of 500, 1000, 1500, 2000, 2500 and 5000 feet from the center of the area with the highest density of WES(s). For projects with multiple WES(s), the combined sound level impact for all WES(s) operating at full load must be estimated.

The above tables must include the impact (increased dBA and dBC above baseline L90 Background sound levels) of the WES operations on all residential and other noise sensitive receiving locations within the project boundary. To the extent possible, the tables should include the sites tested in the background study.

Provide a contour map of the expected sound level from the new WES(s), using 5 dBA and 5 dBC increments created by the proposed WES(s) extending out to a distance of at least 2500 feet from the project boundary or the 35 dBA or 50 dBC boundary whichever is greater.

Provide a description of the impact of the proposed sound from the WES project on the existing environment. The results should anticipate the receptor sites that will be most negatively impacted by the WES project

and to the extent possible provide data for each MP that are likely to be selected in the background sound study (note the sensitive receptor MPs):

- a. Report expected changes to existing sound levels for LAeq, L10 and L90, in dBA
- b. Report expected changes to existing sound levels for LCeq, L10 and L90, in dBC
- c. Report the predicted sound pressure levels for each of the 1/1 octave bands as un-weighted dB in tabular form from 8 Hz to 10k Hz.
- d. Report all assumptions made in arriving at the estimate of impact, any limitations that might cause the sound levels to exceed the values of the estimate, and any conclusions reached regarding the potential effects on people living near the project area. If the effects of coherence, worst case weather, or operating conditions are not reflected in the model a discussion of how these factors could increase the predicted values is required.
- e. Include an estimate of the number of hours of operation expected from the proposed WES(s) and under what conditions the WES(s) would be expected to run. Any differences from the information filed with the Application should be addressed.

4. **Post-Construction Measurements**

Post Construction Measurements should be conducted by a qualified noise consultant selected by and under the direction of the Political Subdivision. The requirements of this Appendix for Sites with Existing Wind Energy Systems shall apply

- (1) Within twelve months of the date when the project is fully operational, and within two weeks of the anniversary date of the Pre-construction ambient noise measurements, repeat the existing sound environment measurements taken before the project approval. Post-construction sound level measurements shall be taken both with all WES(s) running and with all WES(s) off except as provided by the ordinance.
- (2) Report post-construction measurements to the Political Subdivision using the same format as used for the background sound study.

- (3) Project Boundary: A continuous line encompassing all WES(s) and related equipment associated with the WES project.

REFERENCES

ANSI/ASA S12.9-1993/Part 3 (R2008) - American National Standard Quantities and Procedures for Description and Measurement of Environmental Sound, Part 3: Short-Term Measurements with an Observer Present.

This standard is the second in a series of parts concerning description and measurement of outdoor environmental sound. The standard describes recommended procedures for measurement of short-term, time-average environmental sound outdoors at one or more locations in a community for environmental assessment or planning for compatible land uses and for other purposes such as demonstrating compliance with a regulation. These measurements are distinguished by the requirement to have an observer present. Sound may be produced by one or more separate, distributed sources of sound such as a highway, factory, or airport. Methods are given to correct the measured levels for the influence of background sound. For the purposes of this ordinance the options that are provided in ANSI S12.9-Part 3 (2008) shall be applied with the additional following requirements:

Wind Turbine Siting Acoustical Measurements
ANSI S12.9 Part 3 Selection of options and other requirements

- 5.2 background sound: Use definition (1) long-term
- 5.3 long-term background sound: The L90 excludes short term background sounds
- 5.4 basic measurement period: Ten (10) minutes L90(10 min)
- 5.6 Sound Measuring Instrument: Type 1 integrating meeting ANSI S1.43
- 6.5 Windscreen: Required
- 7.1 Long-term background sound
- 7.2 Data collection Methods: Second method Observed samples to avoid contamination by short term sounds (purpose: to avoid loss of statistical data)
- 8 Source(s) Data Collection: All requirements in ANSI S12.18 Method #2 precision to the extent possible while still permitting testing of the conditions that lead to complaints.
 - 8.3(a) All meteorological observations required at both (not either) microphone and nearest 10m weather reporting station.
 - 8.3(b) For a 10 minute sound measurement to be valid the wind velocity shall not exceed 2m/s (4.5 mph) measured less than 5m from the microphone. Compliance sound measurements shall not be taken when winds exceed 4m/s.
 - 8.3(c) In addition to the required acoustic calibration checks, the sound measuring instrument internal noise floor must also be checked at the end of each series of ten minute measurements and no less frequently than once per day. Insert the microphone into the acoustic calibrator with the calibrator signal off. Record the observed dBA and dBC reading from the sound level meter or other recording instrument to determine an approximation of the instrument self noise. This calibrator covered microphone must demonstrate that the results of this test are at least 5 dB below the immediately previous ten minute acoustic test results for the acoustic data to be valid. This test is necessary to detect undesired increase in the microphone and sound level meter internal self noise. As a precaution, sound measuring instrumentation should be removed from any air conditioned space at least an hour before use. Nighttime measurements are often performed very near the dew point. Minor moisture condensation inside a microphone or sound level meter can increase the instrument self noise and void the data.
- 8.4 to the end: The remaining sections of ANSI S12.9 Part 3 Standard do not apply.

ANSI S12.18-1994 (R2004) American National Standard Procedures for Outdoor Measurement of Sound Pressure Level

This American National Standard describes procedures for the measurement of sound pressure levels in the outdoor environment, considering the effects of the ground, the effects of refraction due to wind and temperature gradients, and the effects due to turbulence. This standard is focused on measurement of sound pressure levels produced by specific sources outdoors. The measured sound pressure levels can be used to calculate sound pressure levels at other distances from the source, or to extrapolate to other environmental conditions, or to assess compliance with regulation. This standard describes two methods to measure sound pressure levels outdoors. METHOD No. 1:

general method; outlines conditions for routine measurements. METHOD No.2: precision method; describes strict conditions for more accurate measurements. This standard assumes the measurement of A-weighted sound pressure level or time-averaged sound pressure level or octave, 1/3-octave or narrow-band sound pressure level, but does not preclude determination of other sound descriptors.

ANSI S1.43-1997(R2007) American National Standard Specifications for Integrating Averaging Sound Level Meters

This Standard describes instruments for the measurement of frequency-weighted and time-average sound pressure levels. Optionally, sound exposure levels may be measured. This standard is consistent with the relevant requirements of ANSI S1.4-1983(R 1997) American National Standard Specification for Sound Level Meters, but specifies additional characteristics that are necessary to measure the time-average sound pressure level of steady, intermittent, fluctuating, and impulsive sounds.

ANSI S1.11-2004 American National Standard 'Specification for Octave-Band and Fractional-Octave-Band Analog and Digital Filters'

This standard provides performance requirements for analog, sampled-data, and digital implementations of bandpass filters that comprise a filter set or spectrum analyzer for acoustical measurements. It supercedes ANSI S1.11-1986 (R1998) American National Standard Specification for Octave-Band and Fractional-Octave-Band Analog and Digital Filters, and is a counterpart to International Standard IEC 61260:1995 Electroacoustics - Octave-Band and Fractional-Octave-Band Filters. Significant changes from ANSI S1.11-1986 have been adopted in order to conform to most of the specifications of IEC 61260:1995. This standard differs from IEC 61260:1995 in three ways: (1) the test methods of IEC 61260 clauses 5 is moved to an informative annex, (2) the term 'band number,' not present in IEC 61260, is used as in ANSI S1.11-1986, (3) references to American National Standards are incorporated, and (4) minor editorial and style differences are incorporated.

ANSI S1.400-2006 American National Standard Specifications and Verification Procedures for Sound Calibrators

IEC 61400-11

Second edition 2002-12, Amendment 1 2006-05

IEC 61400-11

Second edition 2002-12, Amendment 1 2006-0

Wind turbine generator systems –Part 11: Acoustic noise measurement techniques

The purpose of this part of IEC 61400 is to provide a uniform methodology that will ensure consistency and accuracy in the measurement and analysis of acoustical emissions by wind turbine generator systems. The standard has been prepared with the anticipation that it would be applied by:

- the wind turbine manufacturer striving to meet well defined acoustic emission performance requirements and/or a possible declaration system;
- the wind turbine purchaser in specifying such performance requirements;
- the wind turbine operator who may be required to verify that stated, or required, acoustic performance specifications are met for new or refurbished units;
- the wind turbine planner or regulator who must be able to accurately and fairly define acoustical emission characteristics of a wind turbine in response to environmental regulations or permit requirements for new or modified installations.

This standard provides guidance in the measurement, analysis and reporting of complex acoustic emissions from wind turbine generator systems. The standard will benefit those parties involved in the manufacture, installation, planning and permitting, operation, utilization, and regulation of wind turbines. The measurement and analysis techniques recommended in this document should be applied by all parties to ensure that continuing development and operation of wind turbines is carried out in an atmosphere of consistent and accurate communication relative to environmental concerns. This standard presents measurement and reporting procedures expected to provide accurate results that can be replicated by others.

Wisconsin Citizens Safe Wind Siting Guidelines

References

The following sources, organized by year of publication, provide the scientific basis for the “Wisconsin Citizens Safe Wind Siting Guidelines”. These references also highlight the outdated and arbitrary nature of the proposed Wind Siting Rules (PSC 128) drafted in 2010.

2012:

Barbara J Frey, BA, MA (University of Minnesota), Peter J Hadden, BSc (Est Man) FRICS, Wind Turbines And Proximity To Homes: The Impact Of Wind Turbine Noise On Health, **January, 2012**.
http://docs.wind-watch.org/Frey_Hadden_WT_noise_health_01Jan2012.pdf

2011:

Stephen E. Ambrose, INCE (Brd. Cert.), Robert W. Rand, INCE Member, The Bruce McPherson Infrasound and Low Frequency Noise Study - Adverse Health Effects Produced By Large Industrial Wind Turbines Confirmed, **December 14, 2011**.
<http://randacoustics.com/wp-content/uploads/2011/12/The-Bruce-McPherson-ILFN-Study.pdf>

Carmen M.E. Krogh, BScPharm, Brett S. Horner, BA, CMA, “A summary of new evidence: Adverse health effects and industrial wind turbines”, **August 2011**.
<http://www.windaction.org/documents/32829>

Krogh, C. M. E., “Industrial wind turbine development and loss of social justice?” *Bulletin of Science Technology & Society*, **August 2011** vol. 31 no. 4 pages 321-333.
<http://bst.sagepub.com/content/31/4/321>

Daniel Shepherd, David McBride, David Welch, Kim N. Dirks, Erin M. Hill, “Evaluating the impact of wind turbine noise on health-related quality of life,” *Noise & Health*, **September 2011** vol. 13 issue 54 pages 333-339.
<http://www.noiseandhealth.org/article.asp?issn=1463-1741;year=2011;volume=13;issue=54;spage=333;epage=339;aulast=Shepherd>

Bronzaft, A. L., “The Noise from wind turbines: Potential adverse impacts on children's well-being,” *Bulletin of Science Technology & Society*, **August 2011** vol. 31 no. 4 pages 291-295.
<http://bst.sagepub.com/content/31/4/291>

McMurtry, R. Y. , “Toward a case definition of adverse health effects in the environs of industrial wind turbines: Facilitating a clinical diagnosis,” *Bulletin of Science Technology & Society*, **August 2011** vol. 31 no. 4 pages 316-320.
<http://bst.sagepub.com/content/31/4/316>

Environmental Review Tribunal, Case Nos.: 10-121/10-122 Erickson v. Director, Ministry of the Environment, Jerry V. DeMarco, Panel Chair and Paul Muldoon, Vice-Chair, **July 2011**
<http://www.ert.gov.on.ca/files/201108/00000300-AKT5757C7CO026-BHH51C7A7SO026.pdf>

Harrison, J. P., “Wind turbine noise,” *Bulletin of Science Technology & Society*, **August 2011** vol. 31 no. 4 pages 256-261.
<http://bst.sagepub.com/content/31/4/256>

INCE/Europe, *Wind Turbine Noise 2011— Post conference report*, **April 2011**.
http://www.confweb.org/wtn2011/index.php?option=com_content&view=article&id=70:report&catid=35:information

Michael Nissenbaum MD, Jeff Aramini PhD, Chris Hanning MD, “Adverse health effects of industrial wind turbines: a preliminary report,” *10th International Congress on Noise as a Public Health Problem*, **July 2011**.
http://www.healthywindwisconsin.com/Nissenbaum%20et%20al%20ICBEN2011_0158_final.pdf

2011 (continued):

Krogh, C. M. E., Gillis, L., Kouwen, N., and Aramini, J., "WindVOiCe, a self-reporting survey: adverse health effects, industrial wind turbines, and the need for vigilance monitoring," *Bulletin of Science Technology & Society*, **August 2011** vol. 31 no. 4 pages 334-345.
<http://bst.sagepub.com/content/31/4/334>

Laurie, S., "Submission to the Australian Federal Senate Inquiry on rural wind farms," by Dr. Sarah Laurie, BMBS, Medical Director Waubra Foundation, **February 2011**.
<http://docs.wind-watch.org/Laurie-Australia-Senate-submission-final.pdf>

Møller, H. & C. S. Pedersen, "Low-frequency noise from large wind turbines," *Journal of the Acoustical Society of America*, **June 2011** vol. 129 no. 6 pages 3727-3744.
<http://dx.doi.org/10.1121/1.3543957>

Phillips, C. V., "Properly interpreting the epidemiologic evidence about the health effects of industrial wind turbines on nearby residents," *Bulletin of Science Technology & Society*, **August 2011**, vol. 31 no. 4, pages 303-315.
<http://bst.sagepub.com/content/31/4/303>

Richarz, W., Richarz, H., and Gambino, T., "Correlating very low frequency sound pulse to audible wind turbine sound," INCE/Europe Fourth International Meeting on Wind Turbine Noise, Rome Italy, 12-14 **April 2011**.

Cited in: <http://windconcernsontario.wordpress.com/2011/05/23/presentation-from-the-fourth-international-meeting-on-wind-turbine-noise/>

Salt, A. N. & Kaltenbach, J. A., "Infrasound From wind turbines could affect humans," *Bulletin of Science Technology & Society*, **August 2011** vol. 31 no. 4 pages 296-302.
<http://bst.sagepub.com/content/31/4/296>

Senate Standing Committees on Community Affairs (Parliament of Australia), "The social and economic impact of rural wind farms," **2011**.
http://www.aph.gov.au/senate/committee/clac_ctte/impact_rural_wind_farms/index.htm

Shain, M., "Public health ethics, legitimacy, and the challenges of industrial wind turbines: The Case of Ontario, Canada," *Bulletin of Science Technology & Society*, **August 2011** vol. 31 no. 4 pages 346-353.
<http://bst.sagepub.com/content/31/4/346>

Shepherd, D., McBride, D., Welch, D., Dirks, K., Hill, E., Wind turbine noise and health-related quality of life nearby residents: a cross-sectional study in New Zealand. Fourth International Meeting on Wind Turbine Noise. Rome Italy **April 2011**
http://www.maine.gov/dep/ftp/bep/ch375citizen_petition/pre-hearing/AR-30%20chapter%20375%20-%20r%20brown%20hearing%20submission%20-%20Shepherd%20et%20al%20Wind%20turbine%20noise%20%20Quality%20of%20Life%20Rome%202011.pdf

Thorne, B., "The Problems with 'noise numbers' for wind farm noise assessment," *Bulletin of Science Technology & Society*, **August 2011** vol. 31 no. 4 pages 262-290.
<http://bst.sagepub.com/content/31/4/262>

Vanderburg, W. H., "Assessing our ability to design and plan green energy technologies," *Bulletin of Science Technology & Society*, **August 2011** vol. 31 no. 4 pages 251-255
<http://bst.sagepub.com/content/31/4/251>

Oregon Health Authority, Oregon Public Health Division, Office of Environmental Public Health, "Health impacts of wind energy facilities," **2011**.
<http://public.health.oregon.gov/HealthyEnvironments/TrackingAssessment/HealthImpactAssessment/Pages/windenergy.aspx>

2010:

Chief Medical Officer of Health (of Ontario), Report: "The potential health impact of wind turbines," **May 2010**.

http://www.health.gov.on.ca/en/public/publications/ministry_reports/wind_turbine/wind_turbine.pdf

Hanning, C., "Wind turbine noise, sleep And health"—Summary paper prepared by Dr. Christopher Hanning. BSc, MB, BS, MRCS, LRCP, FRCA, MD, **November 2010**.

http://www.acousticecology.org/wind/winddocs/health/Hanning%202010_Wind%20turbine%20noise%20sleep%20and%20health%20November%202010.pdf

Ito, A. & T. Takeda, "Sickness claims prompt study of wind turbines [by the The Environment Ministry of Japan]," *The Asahi Simbun*, **January 2010**.

<http://www.asahi.com/english/TKY201001180410.html>

National Health and Medical Research Council (of Australia). "Wind turbines and health: a rapid review of the evidence," **2010**

<http://www.nhmrc.gov.au/publications/synopses/new0048.htm>

Nissenbaum, M., Press conference by Michael Nissenbaum, MD Radiologist in Vermont's State House, May 7, **2010**, (video).

<http://vimeo.com/11577982>

Pierpont, N., Letter to the Vermont State House of Representatives from Nina Pierpont, MD, PhD, Fellow of the American Academy of Pediatrics, Co-signed by the following:

- George Kamperman, PE, President, Kamperman Associates, Inc., Board-Certified Member of Institute of Noise Control Engineers, Fellow Member of Acoustical Society of America, Member of National Council of Acoustical Consultants,
- F. Owen Black, MD, Fellow of the American College of Surgeons, Board-Certified Otolaryngologist, Senior Scientist, Director of Neurotology Research Balance & Hearing Center North West, Legacy Health System
- Joel F. Lehrer, MD, Fellow of the American College of Surgeons, Board-Certified Otolaryngologist and Head and Neck Surgeon, Served on Hearing and Equilibrium Subcommittee of the American Academy of Otolaryngology and Head and Neck Surgery, Clinical Professor of Otolaryngology, University of Medicine & Dentistry of NJ,
- Stanley M. Shapiro, MD, Fellow of the American College of Cardiology, Board-Certified Internal Medicine, Cardiovascular Diseases, and Nuclear Cardiology, Champlain Valley Cardiovascular Associates,

February 2010.

<http://docs.wind-watch.org/Pierpont-et-al.-to-Klein-2-10-10.pdf>

Punch, J., James, R., & Pabst, D., (2010), "Wind-turbine noise: What audiologists should know," *Audiology Today*, **July-August 2010**.

<http://www.windaction.org/?module=uploads&func=download&fileId=2047>

Salt, A., "Infrasound: Your ears 'hear' it but they don't tell your brain"—Powerpoint presentation by Alec N. Salt, Ph.D., Department of Otolaryngology, (2010), Washington University School of Medicine, First International Symposium on Adverse Health and Wind Turbines, **Sept 2010**.

http://windvigilance.com/downloads/symposium2010/swv_symposium_presentation_infrasound_your_ears_hear_it_2.pdf

Salt, A. N. & Hullar, T. E., "Responses of the ear to low frequency sounds, infrasound and wind turbines," *Hearing Research*, **September 2010** vol. 268 nos. 1-2 pages 12-21.

<http://www.ncbi.nlm.nih.gov/pubmed/20561575>

2010 (continued):

Thorne, R., "Assessing noise from wind farms,"—Powerpoint presentation by Robert Thorne, PhD in Health Science from Massey University, New Zealand for The Society for Wind Vigilence, First International Symposium, **October 2010**.

http://acousticology.org/wind/winddocs/noise/swv_symposium_paper_thorne%20slides_assessing_noise_from_wind_farms%20copy.pdf

Thorne, R. (Noise Measurement Services), "Noise impact assessment report - Waubra Wind Farm," prepared by Robert Thorne, PhD in Health Science from Massey University, New Zealand, **July 2010**.

<http://docs.wind-watch.org/Dean-Waubra-Noise-Impact-July-20101.pdf>

2009:

Minnesota Department of Health, "Public health impacts of wind turbines"

<http://www.health.state.mn.us/divs/eh/hazardous/topics/windturbines.pdf>

World Health Organization, "Night noise guidelines for Europe."

http://www.euro.who.int/_data/assets/pdf_file/0017/43316/E92845.pdf

2008:

DeGagne, D. C., & Lapka, S. D., "Incorporating low frequency noise legislation for the energy industry in Alberta, Canada," *Journal of Low Frequency Noise, Vibration and Active Control* **September 2008** vol. 27, no. 2 pages 105-120.

http://www.noisesolutions.com/uploads/images/pages/resources/pdfs/Noise_Legislation.pdf

2007:

Alves-Pereira, M. & N. C. Branco, "Industrial wind turbines, infrasound and vibro-acoustic disease (VAD)," A report by Professor Mariana Alves-Pereira, School of Health Sciences (ERISA), Lusofona University Portugal, Department of Environmental Sciences & Engineering New University of Lisbon Portugal, Nuno Castelo Branco, MD, Surgical Pathologist, President Scientific Board Center for Human Performance (CPH), **May 2007**

<http://www.psc.nd.gov/database/documents/08-0034/091-010.pdf>

Harry, A., "Wind turbines noise and health," A report from the UK by Dr. Amanda M.B.Ch.B.P.G.ENT, **Feb 2007**.

<http://www.psc.nd.gov/database/documents/08-0034/077-010.pdf>

2004:

Leventhall, H. G., "Low frequency noise and annoyance," *Noise & Health*, **Apr-Jun 2004** vol. 6 no. 23 pages 59-72.

<http://www.ncbi.nlm.nih.gov/pubmed/15273024>

Schust M., "Effects of low frequency noise up to 100 Hz," *Noise & Health* **Apr-Jun 2004** vol. 6 no. 23 pages 73-85.

<http://www.ncbi.nlm.nih.gov/pubmed/15273025>

2003:

Leventhall, H. G., assisted by P. Pelmear & S. Benton, "A review of published research on low frequency noise and its effects." Project Report. Department for Environment, Food and Rural Affairs, UK, **2003**.

<http://westminsterresearch.wmin.ac.uk/4141/>

1999:

World Health Organization, "Guidelines for community noise," edited by B. Berglund, T. Lindvall, T., & D. H. Schwela, Geneva; OMS, **1999**.

<http://whqlibdoc.who.int/hq/1999/a68672.pdf>