Assistant Prosecutors:

Juvenile Division
Lori L. Reisinger

Civil Division
Scott D. Schockling
Richard L. Houghton, III

NICK A. SELVAGGIO
Prosecuting Attorney of Champaign County
Champaign County Courthouse
200 North Main Street
Urbana, Ohio 43078
Phone: (937) 484-1900
Fax: (937) 484-1901

Victim/Witness Division
Peggy L. Baker
Jean A. Erickson

Office Administrator
Sandi G. Perry

May 20, 2008

All Champaign County Township Trustees
Champaign County Commissioners
Logan-Union-Champaign Planning Commission
Champaign County Community Improvement Corporation
Wayne Township Zoning Commission Members
Union Township Zoning Commission Members

Greetings,

I am pleased to present to you the report of the Champaign County Wind Turbine Study Group ("WTSG").

This report is a culmination of eight months of effort (five months of weekly meetings to study the issues and another three months drafting and rewriting the final product) by representatives of township and county government, industry, agriculture and community activists.

The report contains neither draft model legislation nor a recommendation for or against endorsement of "wind turbines."

Rather, the report contains the results of the research and critical analysis compiled by members of the WTSG regarding fourteen readily identifiable issues associated with wind energy development. The WTSG chose to present its work product in a format that is easy to read and understand. Each issue is specifically defined, with accompanying information assessments and recommendations for action.

The WTSG wants local decision-makers to utilize this report as part of the total consideration process when or if their particular jurisdiction contemplates taking legislative or regulatory action with regard to wind energy development.

I am very proud of the commitment WTSG members showed in our 7 a.m. weekly meetings. I want to also recognize Christopher A. Walker, Esq. for his extraordinary efforts in serving the WTSG as recording secretary for purposes of drafting and rewriting this report.

I urge interested readers to use the WTSG report as starting point when considering their own feelings on wind energy development. While this document will not settle the debate, it will most certainly assist our citizenry in determining what is in the best interests of the Champaign County community where wind energy comes to mind.

Thank you for your consideration.

Very Truly Yours,

Nick A. Selvaggio
Chair, Champaign County Wind Turbine Study Group
Champaign County Prosecuting Attorney

Enclosures
cc: Champaign County Wind Turbine Study Group
file

Champaign County, Ohio
Wind Turbine Study Group

"To inform the decision-makers"

May 2008

Jon Berry, Champaign County Farm Bureau

Jason Dagger, Champaign County Farm Bureau

Hon. Grant Johnson, Wayne Township Trustee

Julie Johnson, Union Neighbors United

Diane McConnell, Union Neighbors United

Mike Pullins, Everpower Renewables Corp.

Hon. Nick A. Selvaggio, Champaign County Prosecuting Attorney

Hon. Fereidoun Shokouhi, Champaign County Engineer

Mike Speerschneider, Everpower Renewables Corp.

Hon. Jim Virts, Union Township Trustee

Christopher A. Walker, Esq., Union Neighbors United

Foreword

BACKGROUND OF THE WTSG

In May 2007, a local citizen's group, Union Neighbors United, called upon its Champaign County, Ohio elected officials to provide a forum from which discussion could be held on issues surrounding proposed wind turbine development in their township. This group of citizens wanted to explore acceptable approaches to wind energy regulation to ensure that wind energy development would have the least amount of impact on the health, safety and welfare of Champaign County residents and its surrounding habitat.

In the months that followed, farmers and owners of undeveloped lands solicited their local governmental leaders for equal opportunity to engage in dialogue that would enable them to voice support for wind turbine placement. These groups of citizens felt strongly that this type of renewable resource would provide the prospects of clean energy, jobs and economic development to Champaign County.

In September 2007, the Champaign County Prosecutor's Office agreed to facilitate a series of weekly community meetings. Participants would be culled from a balanced set of primary stakeholders for the purpose of sharing information, exchanging ideas and exploring areas of mutual agreement regarding the potential placement of wind turbines in Champaign County.

The result was the formation of the Champaign County Wind Turbine Study Group (WTSG). Champaign County Prosecutor Nick A. Selvaggio solicited named representatives from Champaign County Farm Bureau, Champaign County Township Trustees Association, Everpower Renewables Corp., Logan-Union-Champaign Regional Planning Commission, and Union Neighbors United to critically debate the merits and consequences of wind energy development in Champaign County. Although participation in the discussions would be limited to named WTSG members, the WTSG felt that by having its meetings open to the public, it would guarantee transparent access to materials studied and viewpoints debated.

For twenty-four weeks, members of the WTSG were given the opportunity to present research materials from a previously developed list of agreed upon topics. Upon the completion of one presentation, the other stakeholders were given the opportunity to present similar or alternative viewpoints and materials on the same topic. Meeting notes were taken and a compilation of materials presented were retained for bibliographical reference and possible future use.

MISSION OF THE WTSG

The stated mission of the WTSG was "to inform the decision-makers." Specifically, the WTSG wanted to acquire, organize and assess relevant topical information on a variety of wind energy issues. Using the acquired resources, the WTSG would seek to provide input and formulate recommendations to local

decision-makers who might be considering a governmental response to potential wind energy development in their region of Champaign County.

WTSG members were mindful that Ohio law places governing responsibility for electrical generation projects over 50 megawatts on the Public Utilities Commission of Ohio (PUCO) and its Power Siting Board. WTSG members considered whether their informational gathering role should result in formulating regulatory guidelines to local leaders. WTSG members decided that they would not draft model ordinances for local governments to consider. Instead, the WTSG chose to develop a report based on informational assessments and recommendations of multiple issues related to wind energy development.

The WTSG was not created by Ohio statutory law. The WTSG has no formal or statutory rule-making authority. The WTSG is comprised of an informal group of concerned community stakeholders that were assembled to study the merits of wind energy development. But for WTSG industry representatives, the members of the WTSG have no specialized knowledge or training in wind energy development. Thus, this document is limited in its ability to be an authoritative guideline on wind energy development due to the educational limitations of its membership.

Yet, WTSG members were vigilant in acquiring information from a variety of sources. They discovered an overwhelming amount of information available from government agencies, private companies, consultants and organizations from proponents and opponents of wind energy. In addition, news articles and anecdotal stories were found available for review. The materials collected by the WTSG are available in total and can be assessed, with the report, at the Champaign County Public Library.

For every document discovered, there were many others not retrieved for review. As such, any cited materials herein should not be considered to be an exhaustive list of available resources. To the extent that readers of this document wish to consider additional information to assess and weigh the credibility of the information and conclusions set forth in this report, readers are cautioned to consider relevant research and data from qualified experts.

In addition to reviewing this document and reading other materials, the WTSG encourages local decision-makers studying wind energy development to visit operating wind farms and consult with other local officials who have previously studied similar issues in their own communities.

FINDINGS AND RECOMMENDATIONS OF THE WTSG

The findings and recommendations of the WTSG are topically organized as follows:

The WTSG studied fourteen (14) different wind energy development topics: Aesthetics, Blade Throw, Decommissioning, Economics, Environmental Impacts, FAA Lighting, Fire/Emergency Response, Ice Shed/Throw, Noise, Road Infrastructure, Shadow Flicker, Telecommunications, Turbine Collapse and Vandalism. The findings and recommendations of the WTSG are topically presented in alphabetical order.

The reader will notice that there are varying page lengths of discussion to some of the topics presented herein. The WTSG cautions the reader not to infer that a higher priority or significance was allocated to a topic simply based on the resulting "page length differential." The WTSG considers each topic equally important to forming a healthy, safe, efficient and economically viable wind energy development plan for our community. Instead, the WTSG trusts that the reader will recognize that a topic's resulting page length was attributable to the WTSG's finding that certain topics merited more vigorous debate based on the nature and content of the material available for review and analysis.

For each topic covered, the WTSG defines the problem or issue involved. A summary assessment of the information presented is then provided. The WTSG concludes a review of the topic by offering recommendations for the decision-maker on how to mitigate any potential adverse impact that the particular problem may have on the local community. Where the WTSG failed to reach unanimity on a particular subject, the alternative viewpoint(s) were provided for the reader's consideration.

A complete bibliography of information as chronologically presented to and considered by the WTSG is included in the appendix.

In summary, consideration should be given to balancing the positive and negative impacts of wind energy on host properties, nonparticipating properties, and the overall community. Decision-makers should take into account cumulative impacts of wind energy projects in the context of other development in the region. Residents, businesses and entities in the vicinity of proposed sites can benefit from a transparent governmental review process in which occasions to voice support, opposition or concern may be made. Opportunities exist to mitigate the negative impacts of wind turbine developments through zoning ordinances and use of scientifically accepted methodology.

The WTSG recognizes there are practical arguments for encouraging the WTSG to continue its study of the issues through the coming months and even years. As technology evolves and more research is published and peer reviewed, calls for further debate will most certainly ensue. However, the WTSG recognizes that perpetuating the discussion only serves to delay the delivery of information to Champaign County's leadership. At some point, the findings must translate into action. It is hoped that this document and its referenced materials will assist our governmental representatives in formulating an action plan that will serve the public good of Champaign County, Ohio.

- Nick A. Selvaggio, WTSG Chair

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1. Aesthetics:

Definition of Issue:

- Aesthetics has been raised as a concern about wind-energy projects. While some people think turbines are pleasing to view, others likely will not agree. Taking care to place the turbines in a manner that takes aesthetics into account will help the project fit more harmoniously with the community.

Information Assessment:

- There are a number of reasons why proposed wind-energy projects evoke aesthetic concerns. Modern wind turbines are relatively new to the United States. Some of the early projects were built in remote areas, but increasingly they are being built in or proposed for areas that are close to residential and recreational uses, and often in areas never before considered for wind power uses. The turbines are often taller than any local zoning ordinance, and they are impossible to screen from view. The movement of the blades makes it more likely that they will draw attention. National Research Council, *"Environmental Impacts of Wind-Energy Projects"*, May 2007 at p. 143.

- One commentator suggests that communities with a rural setting and a history of farming might accept harvesting of wind energy as an acceptable use of their land. Ben Hoen, Impacts of Windmill Visibility on Property Values in Madison County, NY (April 2006) (attached as Appendix B to Faulkner, David, Community Improvement Corporation of Champaign County, "Economic Impact Study of Wind Farm Development in Champaign County, Ohio", November 13, 2007).

Recommended Action:

- Local decision-makers should require an aesthetic impact study as part of local jurisdictions' siting and compliance review process. One option for an aesthetic impact study is to require wind developers to provide a visual simulation that depicts how the project would look from different vantage points throughout the project area. The study should specifically address sensitive areas around the project as defined by the local jurisdiction and taking into account, among other things, the policies and designations of the State Historic Preservation Office (SHPO).

- The National Research Council publication, *Environmental Impacts of Wind-Energy Projects* (2007), contains an extensive discussion of how aesthetic impacts can be evaluated in connection with the implementation of projects. National Research Council, *"Environmental Impacts of Wind-Energy Projects"*, May 2007 at p. 173-78, 360-75. This publication may be purchased or accessed online at http://www.nap.edu. Follow the "Energy and Energy Conservation" link.

- Aesthetic impacts can be mitigated by ensuring the project has visual order and uniformity, using turbines and towers of consistent height and design, requiring removal of non-operating structures (as appropriately defined), minimizing the visibility of transmission lines and ancillary

structures, minimizing erosion during project construction and operation, requiring turbines to be painted white or grey, and prohibiting turbine use for telecommunication antennas, billboards, and signs. Gipe, Paul, *"Design As If People Matter: Aesthetic Guidelines for a Wind Power Future"* (referenced in J. Johnson presentation materials Jan. 29, 2008.)

- Utilizing the above considerations, in combination with setbacks as warranted, can result in a wind project that is compatible with most existing land uses.
    - Some, but not all, of the members of the WTSG agree with Paul Gipe that most existing land uses include rural residential, row crops, grazing, commercial, schools, religious sites, some parks, outdoor recreation, tourism, cycling, walking and jogging. Paul Gipe Ag Workshop Powerpoint, Community Wind.
- Members of the WTSG believe that the following questions could help evaluate the potential for undue cumulative aesthetic impacts associated with new wind turbine projects or expansions of existing wind turbine projects. (All of the following considerations are from National Research Council, *"Environmental Impacts of Wind-Energy Projects"*, May 2007 at p. 150-51.)
    - Are the turbines at a scale appropriate to the landscape?
    - Are turbine types and sizes uniform within the area?
    - How great is the offsite visibility of infrastructure (for example, substations and transmission lines)?
    - Have areas that are inappropriate for wind projects (due to terrain, important scenic, cultural, or recreational values) been identified and evaluated?
    - If the project is built as proposed, would the area retain any undeveloped scenic vistas?
- Members of the WTSG acknowledge that there may be difficulty in the interpretation and implementation of the above considerations.
- Some, but not all, of the WTSG members recommend that consideration be given to the potential aesthetic impact of wind turbine projects on populated areas such as cities or villages.

2. Blade Throw:

Definition of Issue:

- Wind turbine blades can fail resulting in blades or blade fragments coming free and being thrown from the turbine.

Information Assessment:

- According to Garrad Hassan Canada, Inc.:

    - The main causes of blade failure are human interface with control systems, lightning strike or manufacturing defect;

    - Evidence suggests that the most common cause of control system failure is human error. Many manufacturers have reduced that risk by limiting the human adjustment that can be made in the field;

    - Lightning strike does not often lead to detachment of blade fragments. Lightning protection systems have developed significantly over the past decade, leading to a significant reduction in structural damage attributable to lightning strikes;

    - Improved experience and quality control, as well as enhancement of design practices, has resulted in a significant diminution of structural defects in rotor blades; and

    - Garrad Hassan is not aware of any member of the public having been injured by a blade or blade fragment from a wind turbine.

    Garrad Hassan Canada, Inc., *"Recommendations for Risk Assessments of Ice Throw and Blade Failure in Ontario"*, May 31, 2007 at p. 12-13 (included in Champaign County Farm Bureau report 12/11/07).

- Blade failure can occur in high wind-speed conditions. Ubarana, Vinicius & Giguere, Philippe, General Electric Energy, *"Extreme Wind Speed – Risk and Mitigation"*, October 2007.

- According to GE Energy:

    - The mode of failure of a wind turbine due to an extreme wind event cannot be generalized and depends on the turbine type and configuration, as well as the specifics of the extreme wind event and site conditions. Examples of possible failure scenarios include blade failure or a tower buckling or overturning. When winds are above the cut-out speed, the wind turbine should have its blades idling in a position creating minimal torque on the rotor. This is the only safety mechanism other than the yaw control. If a grid failure were to occur in conjunction with an extreme wind event—which is a likely scenario—the yaw control will become inactive. The loss of yaw control could increase the likelihood of damage/failure in the case of an extreme wind event. Also, the grid components/structures could also be part of the potential windborne debris. At this time, GE has no modeling capability in place that can predict the impact made to a wind plant if an extreme wind event occurs. Ubarana,

Vinicius & Giguere, Philippe, General Electric Energy, "*Extreme Wind Speed – Risk and Mitigation*", October 2007.

- The safety system must have two mutually-independent braking systems capable of bringing the rotor speed under control in the event of grid failure (as required through IEC specifications). Garrad Hassan Canada, Inc., "*Recommendations for Risk Assessments of Ice Throw and Blade Failure in Ontario*", May 31, 2007 at p. 12-13 (included in Champaign County Farm Bureau report 12/11/07).

- Professor Terry Matilsky of the Department of Physics and Astronomy, Rutgers University, has calculated that it is physically possible for broken blades to be thrown up to 1,680 feet horizontally. Matilsky, Terry, Rutgers University, "*Part I – Basic Kinematics*" at p. 2.

Recommended Action:

- Members of the Study Group had differing views as to the degree of setback that is warranted to protect against blade throw.

    - Some WTSG members are of the view that the precautions and setbacks employed for protection against ice throw (that is, 1.5 x (hub height + blade diameter) from occupied structures, roads and public use areas) are also adequate to protect against blade failure. This view is based on risk-based calculations done for icing situations which consider the frequency of occurrence and the potential travel distance. Wahl, David & Giguere, Philippe, General Electric Energy, "*Ice Shedding and Ice Throw – Risk and Mitigation*", April 2006. Using the recommended setback for ice is appropriate because the physics of anything breaking off the blades, including the blades themselves, is similar. Matilsky, Terry, Rutgers University, "*Part I – Basic Kinematics*" at p. 1.

    - Other WTSG members are of the view that a minimum setback of 1,680 feet is warranted based on the potential for broken blades to be thrown that distance. To protect safety and property on adjacent property, these members also believe that this setback should be measured from the adjacent property line.

3. Decommissioning:

Definition of Issue:

- Once the operational life of the turbines has ended, arrangement must be in place that would ensure the removal of the structures.

Information Assessment:

- Lease Agreements between wind developers and landowners normally include provisions for decommissioning, though these provisions are not necessarily uniform from project to project.

- In practice, decommission generally consists of removal of above-ground and subsurface structures to a depth of at least 36 inches, grading and re-seeding of the surface, unless directed otherwise by the landowner.

Recommended Action:

- Local decision-makers should enact zoning to require that the developer or operator decommission (*i.e.*, dismantle and remove) wind turbines and ancillary structures—

    - At the end of the turbine's useful life (as appropriately defined), or
    - if the turbine is determined to be unsafe or detrimental to health, or
    - If the turbine is in significant violation of applicable zoning requirements.

  Local decision-makers may wish to consider different timelines and remedies for decommissioning under the different circumstances set forth above.

  At the landowner's election, roadways and pads may remain in place.

- Local zoning should require the developer and operator to post a surety bond or other financial assurance that is at least 115% of decommissioning costs (less salvage value) as calculated and certified by a registered professional engineer. Calculation of the decommissioning and salvage should be updated every few years and the fund amount adjusted accordingly.

- Local zoning should specify that wind turbines and ancillary structures that are not decommissioned in accordance with zoning requirements are to be deemed a public nuisance.

- Upon decommissioning, all above-ground and subsurface structures should be removed to a depth of at least thirty-six inches (36") and the site returned, as closely as possible, to its previous state (unless otherwise directed by the landowner).

- Some, but not all, WTSG members believe that the leasing landowner should be jointly obligated with the developer and operator to ensure decommissioning since the leasing landowner is a participant in the wind turbine development. These members also believe that decommissioning is consistent with townships' zoning authority for the purpose of preventing nuisance, protecting public safety, and addressing community aesthetics.

- WTSG members requested a legal opinion from the Champaign County Prosecutor regarding township authority to require decommission bonding or funding. That opinion is attached in Appendix B.

- Some WTSG members believe that the Pennsylvania Model Ordinance for Wind Energy Facilities provides a good example of decommissioning language for zoning documents.

4. Economics:

Definition of Issue:

- Wind energy projects have the potential to impact the local economy in the form of capital investment, jobs, patronization of local businesses, lease payments to host landowners, tax revenue, and property values.

Information Assessment:

- David Faulkner of the Champaign County Improvement Corporation conducted a study examining the potential economic benefits to the community. Faulkner, David, Community Improvement Corporation of Champaign County, "Economic Impact Study of Wind Farm Development in Champaign County, Ohio", November 13, 2007. The study utilized an economic model that was developed by the National Renewable Energy Laboratory (NREL) specifically to estimate the economic benefits from a new wind-energy facility. This model, the JEDI-WIND model, calculates the direct, indirect, and induced economic benefits of new wind energy facilities. National Research Council, *"Environmental Impacts of Wind-Energy Projects",* May 2007 at p. 166-67.

    - The JEDI-Wind model employs economic data developed from numerous operating US wind farms and provides for the use of national statistics or the tailoring of the model to local economic circumstances. The case of the Champaign County Economic Study utilized both national statistics and specific local input data to calculate the economic benefits of the project.

    - Based on input from wind developers active in the area, the Champaign County Economic Study estimates a capital investment of $190 Million to $570 Million, based on wind generation of 100-300 megawatts in the county. Faulkner, David, Community Improvement Corporation of Champaign County, "Economic Impact Study of Wind Farm Development in Champaign County, Ohio", November 13, 2007 at p. 3.

    - The Champaign County Economic Study predicts that this investment in the area will result in significant jobs, economic activity, and tax revenue during both construction and operation.

        - Some, but not all, WTSG members question the CIC's findings and conclusions about local economic benefit on the ground that although the report refers "local" economic impacts, the supporting model utilized default data that reflects statewide economic impacts. http://www.eere.energy.gov/windandhydro/windpoweringamerica/docs/jedi_wind_model.xls (FAQ). Although the model provides an option for inputting county or regional data to run a county or region-specific analysis, the utilization of county or regional data in the Economic Study was limited and unsupported. Furthermore, to estimate the secondary effects of a wind-energy project on a region's economy, the region must be geographically defined. National Research Council, *"Environmental Impacts of Wind-Energy Projects",* May 2007 at p. 166. The Champaign County Economic Study does not adequately define the geographic region over which new jobs, spending, and other

economic impacts are being distributed. For these reasons and other reasons, these members believe that the report's projections of "local" job and spending generation are meaningless.

- Some, but not all, WTSG members feel that the CIC findings are representative of Champaign County and the neighboring counties. The results represent general economic impacts based on the JEDI methodology and Faulkner's knowledge of the local economy. See Faulkner, David, Community Improvement Corporation of Champaign County, "Economic Impact Study of Wind Farm Development in Champaign County, Ohio", November 13, 2007 at p. 3.

- On the subject of the impact of wind turbine development on local property values, the Champaign County Economic Study report concludes, "The only safe conclusion one can draw from the body of work done on this is that there is no definitive understanding or conclusion on the impact wind power development has on property values." Faulkner, David, Community Improvement Corporation of Champaign County, "Economic Impact Study of Wind Farm Development in Champaign County, Ohio", November 13, 2007 at 5.

- In addition, a number of other organizations have made general conclusions about the economic impacts of wind energy:

  - According to Environment Ohio:

    - "In 2001 Ohio spent $29 billion on energy, $16 billion of which was exported to other states or nations. A homegrown clean energy strategy would reduce Ohio's exposure to price spikes, supply distribution, and other repercussions of our reliance on fossil fuels." Environment Ohio & Environment Ohio Research and Policy Center, "*Ohio's Wind Energy Future*", November 2006 at p. 10.

    - "Ohio has the infrastructure to be a leading manufacturer of wind energy technologies. With a national investment in renewable energy and energy efficiency, Ohio could potentially gain more than 22,000 manufacturing jobs. Over 13,000 of these manufacturing jobs would result from an investment in wind power, which is more of a job gain than any other state besides California. The installation and maintenance of wind turbines is a homegrown industry, one that can provide more and better jobs than coal-fired power plants. Over 1,000 companies, located throughout the state, would benefit from increased wind energy production." Environment Ohio & Environment Ohio Research and Policy Center, "*Ohio's Wind Energy Future*", November 2006 at p. 11.

    - Figure 7 of the Environment Ohio report estimates that Champaign County has the potential to gain 50-99 jobs as a result of a nationwide investment in renewable energy. The same figure estimates that the six surrounding counties have the potential to gain a total of 800-1,744 jobs as a result of a nationwide investment in renewable energy, most of which are predicted for Miami County.

    - "Farmers with good wind resources could increase the economic yield of their land by 30 to 100 percent. This could make the difference between insolvency and survival for

many Ohio family farmers." Environment Ohio & Environment Ohio Research and Policy Center, "*Ohio's Wind Energy Future*", November 2006 at p. 12.

- "If Ohio were to take advantage of only 20 percent of [areas with wind speeds high enough to support commercial-scale wind farms,] wind energy could provide 20 percent of Ohio's electricity needs in 2020 (or about 37,000 GWh per year.) The wind turbines would cover only 0.03 percent of Ohio's total land area, allowing farmers to grow crops right up to the turbine base." Environment Ohio & Environment Ohio Research and Policy Center, "*Energizing Ohio's Economy, Creating Jobs and Reducing Pollution with Wind Power*", August 2007 at p. 21.

- According to the American Farmland Trust, for every dollar of tax generated by residential property, there is a cost to service those residences of $1.16. By comparison, the cost to service commercial and industrial property is $0.27 for each dollar of tax revenue generated. Faulkner, David, Community Improvement Corporation of Champaign County, "*Economic Impact Study of Wind Farm Development in Champaign County, Ohio*", November 13, 2007 at p. 11.

- According to the American Wind Energy Association's (hereinafter "AWEA") "Wind Energy and Economic Development: Building Sustainable Jobs and Communities," the European Wind Energy Association has estimated that, in total, every MW of installed wind capability directly and indirectly creates about 60 person-years of employment and 15 to 19 jobs. The rate of job creation will decline as the industry grows and is able to take advantage of economies of scale. AWEA, "Wind Energy and Economic Development: Building Sustainable Jobs and Communities," cited in National Research Council, *"Environmental Impacts of Wind-Energy Projects"*, May 2007 at p. 166.

Recommended Action:

- To fully understand and evaluate the economic impacts of any wind energy project, local decision-makers should require wind developers to provide an economic impact assessment prepared with input from appropriate development agencies such as the Ohio Department of Development and/or the Champaign County Community Improvement Corporation.

5. Environmental Impacts:

Definition of Issue:

- Wind projects, as all human development, can have an impact on local wildlife and wildlife habitat.

Information Assessment:

- There are a number of federal, state, and local agencies that have primary jurisdiction over these issues. The Ohio Department of Natural Resources has jurisdiction over Ohio wildlife species. They are currently developing and adapting measures that will help wind turbine projects avoid or minimize species impacts. U.S. EPA, Ohio EPA, the U.S. Army Corps of Engineers, and other agencies have jurisdiction over wetlands, stormwater and surface water impacts, and other potential environmental impacts from wind turbine developments. Champaign Soil & Water Conservation District oversees drainage and erosion issues.

Recommended Action:

- Local decision-makers should coordinate with the above agencies concerning potential environmental impacts from wind turbine projects.

6. FAA Lighting:

Definition of Issue:

- The FAA requires wind turbines and other tall structures to utilize pulsing lighting for aviation safety.

Information Assessment:

- Wind turbine lighting will be visible in the night sky and will be similar in character to the lighting used for communication towers and other tall structures. This lighting may raise aesthetic concerns. National Research Council, *"Environmental Impacts of Wind-Energy Projects"*, May 2007 at p. 143.

Recommended Action:

- Obstruction lighting must follow FAA requirements. Local decision-makers should consider requiring the project to use the minimum lighting required. All lighting should be synchronized within the development and, if possible, with other nearby wind power developments.

7. Fire/Emergency Response:

Definition of Issue:

- As an operating turbine and a workplace, accidents can occur that will result in damage to the facilities and/or worker injury. Accidents involving maintenance and operation staff are unlikely, but possible and would require local response capabilities.

Information Assessment:

- A turbine fire generally represents a risk only to the structure itself. Response units should be able to handle a turbine fire should it occur by alerting neighbors and protecting the area for ground level fires that may result.

Recommended Action:

- Local governments should request the turbine operator and construction crews to work with emergency crews to be prepared to handle a turbine-related incident. In general, if a fire in the structure occurs, the appropriate course of action is to allow the turbine to burn out while the fire brigade prevents ground based fires from developing. Training for tower rescues should also be included in any emergency preparedness plan. The resources and training for emergency and fire response should be facilitated by the owner/operator of the facility.

- Access to the turbine interior should be secured and strictly limited to authorized personnel.

- Each turbine should have a first responder designation to assist emergency personnel in locating the turbine in the event of an emergency.

- Local decision-makers should consult with providers of emergency medical airlift services to determine whether a wind turbine proposal will affect helicopter access to the project site and surrounding area.

8. Ice Shed/Throw:

Definition of Issue:

- Wind turbines can accumulate ice under certain atmospheric conditions. Shedding of this ice from blades and other surfaces presents a safety concern, particularly below the turbine, that should be considered during project development and operation. In the event that icing sensors fail, ice can be thrown from the rotating blades and can travel a distance. Wahl, David & Giguere, Philippe, General Electric Energy, "*Ice Shedding and Ice Throw – Risk and Mitigation*", April 2006, at p. 2.

Information Assessment:

- Under normal operations, when icing occurs, the turbine will be shut down either automatically or manually. The ice will then shed from the turbine blades before the turbine is re-started. When the turbine is shut down, the risk is confined to an area close to the turbine tower.

Recommended Action:

- Appropriate safety concerns should be addressed by means of a setback. GE Energy, a major manufacturer of wind turbines, suggests a implementing a safe distance equal to 1.5 times the sum of the hub height and the rotor diameter. GE notes also that the actual "safe distance" depends on turbine dimensions, rotational speed, and other factors. Some consulting groups have the capability to provide risk assessment based on site-specific conditions. Wahl, David & Giguere, Philippe, General Electric Energy, "*Ice Shedding and Ice Throw – Risk and Mitigation*", April 2006, at p. 2.

- Wind turbines should be designed with redundant safety mechanisms and procedures to protect themselves by shutting down, either automatically or manually, when icing conditions occur.

- Safety can be further promoted by utilizing appropriately placed signs and other public education efforts warning the public of the dangers associated with wind turbines in winter weather.

- Maintenance staff should also be trained to recognize icing conditions and should confirm that shut down occurs when conditions dictate.

- Some, but not all, WTSG members recommend that because of the potential for injury or property damage on neighboring properties, the above "safe distance" recommendation should also be applied from the boundary of any adjacent nonparticipating property.

9. Noise:

Definition of Issue:

As with any machine involving moving parts, wind turbines generate noise during operation. Noise from wind turbines arises mainly from two sources: (1) mechanical noise caused by the gearbox and generator, and (2) aerodynamic noise caused by interaction of the turbine blades with the wind. Wind turbine noise can be generally classified as being of one of three types: broadband, tonal, and low frequency. National Research Council, *"Environmental Impacts of Wind-Energy Projects"*, May 2007 at p. 157.

Information Assessment:

Characteristics of Wind Turbine Noise:

- Sound from wind turbines is generally classified as mechanical sound or aerodynamic sound. Mechanical sounds are generally "tonal" in character, while aerodynamic sound from turbines is generally "broadband." The tonal sounds are generated by the machinery in the nacelle, including the generator, gearbox, etc. Aerodynamic sounds result from the air flowing over the blades and represent the characteristic "swish" or "whoosh." Aerodynamics sounds generally compose the most dominant type of wind turbine sound. National Research Council, *"Environmental Impacts of Wind-Energy Projects"*, May 2007 at p. 158.

- Under certain conditions, aerodynamic noise from wind turbines has been described as having a swishing, clapping, beating, or thumping character with a modulation that is not well-masked by background noise. Van den Berg, G. P., *Do Wind Turbines Produce Significant Low Frequency Sounds?*, 2004 at p. 4, 8; Pedersen, Eja, *Noise Annoyance from Wind Turbines—A Review,* 2003 at p. 5, 22. In a stable atmosphere, such as at night, this noise is louder than at daytime and (in the case of one cited wind turbine project) can be heard at distances of at least up to 1 kilometer. In the case of multiple wind turbines, the pulses can synchronize, leading to still higher levels of sound. Van den Berg, G. P., *Do Wind Turbines Produce Significant Low Frequency Sounds?*, 2004 at p. 4, 8.

- In addition to the above areas of agreement, different WTSG members felt that the following information was relevant and informative:

- Some, but not all, WTSG members offered the following:

  - Dr. Geoff Leventhall, sound engineer (hereinafter "Leventhall"), states categorically that there is no significant infrasound from current designs of wind turbines. Memorandum of AWS Truewind, "*Wind Energy and Low Frequency Noise*", March 6, 2006, at p. 2.

    - Rebuttal--Although Leventhall insists that there is no significant infrasound from wind turbines, he does concede that wind turbine noise includes a low-frequency component and that such low frequency noise can be audible under certain circumstances. Leventhall, Geoffrey, "*How the 'Mythology' of Infrasound and Low Frequency Noise related to Wind Turbines Might Have Developed*", First International Meeting on Wind Turbine Noise: Perspectives for Control, October 17-18, 2005 at p. 14. Thus, denying the presence of "significant infrasound" in wind turbine noise does not excuse the need to model and monitor for low frequency noise from wind turbines.

  - Research done by Hepburn Explorations has shown that low frequency sound pressure levels are often lower when the turbines are on than when off. This is a result of the turbines converting the energy in the wind to electricity. Memorandum of AWS TrueWind, March 6, 2006, at p. 1.

  - Ambient baseline sound levels will be a function of such things as local traffic, industrial sounds, farm machinery, barking dogs, lawnmowers, children playing and the interaction of the wind with ground cover, buildings, trees, powerlines, etc. It will vary with time of day, wind speed and direction and the level of human activity. As one example, background sound levels measured in the neighborhood of the Hull High School in Hull Massachusetts on March 10, 1992 ranged from 42to 48 dB(A) during conditions in which the wind speed varied from 5 to 9 MPH(2-4m/s). Rogers, Anthony, PhD, et al., "*Wind Turbine Acoustic Noise*", Renewable Energy Research Laboratory, June 2002, Amended January 2006 at p.18.

    - Rebuttal--References to background noise measurements from urban areas are not necessarily representative of rural background noise, which can be at levels in the range of 20-25 dB. James, Richard, E-Coustic Solutions, "*Comments in Response to Everpower Critique of Richard James Presentation*", March 17, 2008 at p. 2.

  - Recent improvements in mechanical design of large wind turbines have resulted in significantly reduced mechanical sounds from both broadband and pure tones. Today, the sound emission from modern wind turbines is dominated by broadband aerodynamic sounds. Rogers, Anthony, PhD, et al., "*Wind Turbine Acoustic Noise*", Renewable Energy Research Laboratory, June 2002, Amended January 2006 at p. 13.

  - As reported by the NRC, in 2004 there were 17,000 turbines in operation in the United States. NRC, *Environmental Effects of Wind-Energy Projects* 42 (2007).

  - Everpower Renewables Corp. sponsored a trip to Bowling Green, Ohio so farmers and landowners could get first hand knowledge of the scope and sound of the

turbines. The Champaign County Farm Bureau sponsored a trip to Leroy, Illinois to visit a large wind turbine project. The public was invited to attend the trip.

- As a result, some, but not all, WTSG members believe we have plenty of local and first hand knowledge on whether the turbines make a sound and if that sound would be an issue.

- Other WTSG members offered the following:

  - A good overview of the nature of sound in general and sound from wind turbines can be found in a report by Anthony Rogers, Ph. D. Rogers, Anthony, PhD, et al., "*Wind Turbine Acoustic Noise*", Renewable Energy Research Laboratory, June 2002, Amended January 2006. This report includes an informative sample noise assessment for a wind turbine project.

  - The misunderstanding on low frequency noise may be associated with the "swish-swish" which is typical for wind turbines. The swish is a modulation of a higher frequency and does not contain low frequencies or infrasound.

  - Dr. Geoff Leventhall has stated, "I can state quite categorically that there is no significant infrasound from current designs of wind turbines. British Wind Energy Association, "*Low Frequency Noise and Wind Turbines, Technical Annex*", February 2005 at p. 8.

  - Numerous studies have shown that low frequency sound output from wind turbines does not significantly exceed background levels, and measures no more than 50-60 dB. Leventhall, Geoffrey, "*How the 'Mythology' of Infrasound and Low Frequency Noise related to Wind Turbines Might Have Developed*", First International Meeting on Wind Turbine Noise: Perspectives for Control, October 17-18, 2005, at p. 13-14; Hessler, David, Hessler Associates, Inc., Speerschneider, Michael, Everpower Renewables Corp., "*Comments in Response to Richard James Presentation*", March 3, 2008, at p. 2.

  - From analysis on existing wind turbines it seems that there is no tendency that the larger wind turbines is creating an excessive amount of low frequency noise compared to the overall noise level. Sondergaard, Bo & Hoffmeyer, Dan, "*Low Frequency Noise from Large Wind Turbines*", Second International Meeting on Wind Turbine Noise, September 20-21, 2007 at p. 21.

  - Frequencies produced by wind turbines below 40 Hz cannot be distinguished from background noise due to wind. Leventhall, Geoffrey, "*How the 'Mythology' of Infrasound and Low Frequency Noise related to Wind Turbines Might Have Developed*", First International Meeting on Wind Turbine Noise: Perspectives for Control, October 17-18, 2005 at p. 14.

- Yet other WTSG members offered the following:

  - Wind turbine noise includes a low-frequency component that, although inaudible (per NRC) or barely audible (per Leventhall), is still perceptible by humans. Leventhall, Geoffrey, "*How the 'Mythology' of Infrasound and Low Frequency Noise*

related to Wind Turbines Might Have Developed", First International Meeting on Wind Turbine Noise: Perspectives for Control, October 17-18, 2005 at p. 14; National Research Council, *"Environmental Impacts of Wind-Energy Projects"*, May 2007 at p. 158-59. This low-frequency component is less diminished by building walls or other structures, and individuals sense or perceive low frequency noise in different ways. Leventhall, Geoffrey, *"A Review of Published Research on Low Frequency Noise and its Effects, Report for DEFRA*", May 2003 at Sections 8.2.4, 13.2. Low frequency noise from wind turbines may be audible under certain circumstances. Leventhall, Geoffrey, *"How the 'Mythology' of Infrasound and Low Frequency Noise related to Wind Turbines Might Have Developed*", First International Meeting on Wind Turbine Noise: Perspectives for Control, October 17-18, 2005 at p. 14. For these reasons, this low-frequency component is important to assess.

- Rebuttal - Leventhall has conducted extensive research on infrasound and low frequency sound in the community and is a leading expert. There are sources of community noise that have generated substantial low frequency sound and infrasound. Concerns about efficient propagation and diminished attenuation are legitimate concerns when taken in the context of significant emitters of low frequency sounds. The DEFRA report does not focus on wind turbine sound, but Leventhall makes it clear in his other work where he does address wind turbine sound that low frequency sound and infrasound from wind turbines is, in general, not an issue. Leventhall, *"How the "mythology" of infrasound and low frequency noise related to wind turbines might have developed"*, First International Meeting on Wind Turbine Noise: Perspectives for Control, October 17-18, 2005 at p. 13-14; British Wind Energy Association, *"Low Frequency Noise and Wind Turbines, Technical Annex*", February 2005 at p. 2.
- Rebuttal - Leventhall's characterization of wind turbine noise indicates that infrasound and low frequency noise components are not problematic. Aside from saying definitively that infrasound is not a problem (Leventhall, Geoffrey, *"How the 'Mythology' of Infrasound and Low Frequency Noise related to Wind Turbines Might Have Developed*", First International Meeting on Wind Turbine Noise: Perspectives for Control, October 17-18, 2005 at p. 14), he states; "The concerns of the WHO on low frequency noise require us to look carefully at low frequency noise from wind turbines. In general, there is not a problem, although the mythology is that wind turbine noise has a substantial low frequency component." Leventhall, Geoffrey, *"How the 'Mythology' of Infrasound and Low Frequency Noise related to Wind Turbines Might Have Developed*", First International Meeting on Wind Turbine Noise: Perspectives for Control, October 17-18, 2005 at p. 13. The data presented by Leventhall to make even these diminutive statements regarding wind turbine sound are based on measurements taken just 65 meters (213 feet) from a turbine. Leventhall, Geoffrey, *"How the 'Mythology' of Infrasound and Low Frequency Noise related to Wind Turbines Might Have Developed*", First International Meeting on Wind Turbine Noise: Perspectives for Control, October 17-18, 2005 at p. 14.

- Although wind turbines may generate low-frequency noise at levels of 55 dB, rural background noise can be considerably quieter (e.g., in the range of 20-25 dB). James, Richard, E-Coustic Solutions, "*Comments in Response to Everpower Critique of Richard James Presentation*", March 17, 2008 at p. 2.

    - Rebuttal - There have been a number of studies which have shown that measured low frequency sound from wind turbines are comparable to rural background levels absent of wind turbines. Leventhall, Geoffrey, "*How the 'Mythology' of Infrasound and Low Frequency Noise related to Wind Turbines Might Have Developed*", First International Meeting on Wind Turbine Noise: Perspectives for Control, October 17-18, 2005 at p. 13-14; in Hessler, David, Hessler Associates, Inc., Speerschneider, Michael, Everpower Renewables Corp., "*Comments in Response to Richard James Presentation*", March 3, 2008 at p. 2. According to Sondergaard, "It seems that there is no tendency that the larger wind turbines is [sic] creating an excessive amount of low frequency noise compared to the overall noise level." Sondergaard, Bo & Hoffmeyer, Dan, "*Low Frequency Noise from Large Wind Turbines*", Second International Meeting on Wind Turbine Noise, September 20-21, 2007 at p. 21. Mr. James' measurements showing background levels of 20-25 dB should be treated with caution as his methodology is not defined and they are not substantiated and do not agree with any published reports on wind turbine measurements or rural background sound measurements.

- The variability of background noise levels in different environments is why a thorough, unbiased pre-construction study of community sound is needed. James, Richard, E-Coustic Solutions, "*Comments in Response to Everpower Critique of Richard James Presentation*", March 17, 2008 at p. 2.

- Turbine noise is usually most critical within a half-mile of a project. National Research Council, *"Environmental Impacts of Wind-Energy Projects"*, May 2007 at p. 153.

    - Rebuttal--While it has been suggested that potential noise on nearby residents may be less important outside of ½ mile, this does not indicate that noise impacts *will be* important within ½ mile.

Effects of Wind Turbine Noise:

- Different WTSG members felt that the following information was relevant and informative:

    - Some, but not all, WTSG members offered the following:

        - Modern wind turbines that utilize upwind blade orientations have dramatically reduced tower interaction effects, and the generation of high levels of low frequency noise by wind turbines. British Wind Energy Association (hereinafter BWEA), "*Low Frequency Noise and Wind Turbines, Technical Annex*", February 2005 at p. 1-2.

- There are no direct health effects from noise at the level of noise generated by wind turbines. British Wind Energy Association, "*Low Frequency Noise and Wind Turbines, Technical Annex*", February 2005.

- There is no scientific evidence that noise at the levels generated by wind turbines could cause health issues other than annoyance. Pedersen, Eja, *Noise Annoyance from Wind Turbines—A Review,* 2003 at p. 5.

    - Rebuttal: While it may be disputed whether low frequency noise from wind turbines causes public annoyance, it has been documented that wind turbine noise can cause public annoyance. Pedersen, Eja, *Noise Annoyance from Wind Turbines—A Review,* 2003 at p. 22.

    - Rebuttal: Although Pedersen concludes that wind turbine noise does not directly cause any physical health problems, his conclusion continues, "There is not enough data to conclude if wind turbine noise could induce sleep disturbance or stress-related symptoms." Pedersen, Eja, *Noise Annoyance from Wind Turbines—A Review,* 2003 at p. 22.

- Wind turbines produce low frequency sounds, but it has not been shown this is a major factor contributing to annoyance. Van den Berg, G. P., *Do Wind Turbines Produce Significant Low Frequency Sounds?*, 2004 at p. 1

- Non-sound-related factors also influence individual responses to wind turbines. British Wind Energy Association, "*Low Frequency Noise and Wind Turbines, Technical Annex*", February 2005 at p. 4. This makes it more important that the community is involved in the planning process and is aware of the benefits that will result from the project.

- Research conducted in low frequency noise on modern wind turbines has shown that the levels of low frequency noise have been below thresholds of perception and is therefore not a problem. British Wind Energy Association, "*Low Frequency Noise and Wind Turbines, Technical Annex*", February 2005 at p. 8.

    - Rebuttal: The above report of the British Wind Energy Association cites no specific "accepted" thresholds with which to compare low frequency noise from wind turbines. According to the National Research Council, "More needs to be understood regarding the effects of low-frequency noise on humans." National Research Council, *"Environmental Impacts of Wind-Energy Projects",* May 2007 at p. 158-59.

- The Danish Wind Industry Association and the Danish Environmental Agency confirm that low frequency noise from wind turbines has not been an issue and there have been very few complaints from the general public in the past 20 years. British Wind Energy Association, "*Low Frequency Noise and Wind Turbines, Technical Annex*", February 2005 at p. 6.

    - Rebuttal: The cited information from the report of the Danish Wind Industry Association gives no indication of the number of turbines installed in populated areas of Denmark or the distance of those turbines from residences.

- The German Wind Energy Association has confirmed that no impacts to human health have been proved from low frequency noise from wind turbines in German Studies. British Wind Energy Association, "*Low Frequency Noise and Wind Turbines, Technical Annex*", February 2005 at p. 6.

o Other WTSG members offered the following:

- Low frequency noise can be annoying or distressing to people who are sensitive to its effects. Leventhall, Geoffrey, "*A Review of Published Research on Low Frequency Noise and its Effects, Report for DEFRA*", May 2003 at p. 8.2.4; Pedersen, Eja, *Noise Annoyance from Wind Turbines—A Review,* 2003.

  - Rebuttal: The Leventhall report cited above does not focus on wind turbine sound and primarily addresses the impacts of low frequency sound at levels much higher than is generated by wind turbines.

- Public annoyance from wind turbine noise occurs to a higher degree at low levels than noise annoyance from other sources of community noise such as traffic. Pedersen, Eja, *Noise Annoyance from Wind Turbines—A Review,* 2003 at p. 22.

- A report for the Swedish Environmental Protection Agency cites statistics that at wind turbine noise ranges of 37.5 to 40 dBA, 20% of 356 respondents were very annoyed with the noise. At above 40 dBA, the percentage of highly annoyed respondents increased to 36%. Pedersen, Eja, *Noise Annoyance from Wind Turbines—A Review,* 2003 at p. 13.

  - Rebuttal: It should be recognized that, in addition to the Swedish study reviewed by Pedersen, his report includes review of other research. The Swedish report is the only one that showed a statistical correlation of annoyance to wind turbine sound pressure levels, and leads him to conclude that wind turbine noise is "to a degree correlated to noise exposure." Pedersen, Eja, *Noise Annoyance from Wind Turbines—A Review,* 2003 at p. 22.

- Low-frequency vibration and its effects on humans are not well understood. Sensitivity to such vibration resulting from wind-turbine noise is highly variable among humans. It has recently been stated (Pierpont, Nina, MD, PhD, "*Wind Turbine Syndrome: Noise, Shadow Flicker and Health", August 1, 2006 / "Health Effects of Wind Turbine Noise*", March 2, 2006) that "some people feel disturbing amounts of vibration or pulsation from wind turbines, and can count in their bodies, especially their chests, the beats of the blades passing the towers, even when they can't hear or see them." National Research Council, *"Environmental Impacts of Wind-Energy Projects",* May 2007 at p. 158-59.

- Several studies and reports suggest that certain adverse health effects may be associated with long-term exposure to wind turbine noise, including the infrasound and low-frequency component. *E.g.,* Harry, Amanda Dr., "*Wind Turbines, Noise and Health*", February 2007; Pierpont, Nina, MD, PhD, "*Vibro-Acoustic Disease*", June 9, 2007 (summarizing research conducted in Portugal).

- Noting the need for further scientific data on this subject, in 2006 the French National Academy of Medicine recommended that wind turbines be sited no closer

than 1.5 kilometers (0.93 miles) from residences "while waiting for precise studies of the risks connected with these installations." C-H Chouhard, *Le retentissement du fonctionnement des eoliennes sur la sante de l'homme (Repercussions of wind turbine operations on human health)*, Panorama du Medecin (March 20, 2006), *quoted in* Frey and Hayden, "*Noise Radiation from Wind Turbines Installed Near Homes: Effect on Health*", 2007 at p. 5.

- Yet other WTSG members offered the following:

  - Using available internet search engines, Vibro Acoustic Disease or Wind Turbine Syndrome was not listed as an ailment in any of the following associations or organizations that list known diseases:

    - Medicine Net
    - National Institutes of Health (Office of Rare Diseases)
    - Wikipedia (Internet Encyclopedia)
    - National Organization for Rare Disorders
    - Mayo Clinic

  - In an effort to evaluate the health and safety risks associated with other forms of electrical generation, these presenting members offered the following information regarding the coal industry.

    - In Ohio the burning of coal leads to the premature deaths of 1,700 people per year. Environment Ohio, "*Clean Up Power Plants*", 2007 at p. 2. In the United States according to the American Lung Association (2004 Study) 24,000 premature deaths are attributed each year due to power plant pollution.
    - The ALA notes that research estimates over 550,000 asthma attacks, 38,000 heart attacks, and 12,000 hospital admissions are caused annually by power plant pollution. In the last century more than 100,000 deaths have been a result of mining coal, with over 200,000 black lung deaths. This is part of the burden of coal. TXU Corporate Presentation included in Champaign County Farm Bureau materials dated 1/15/08.
    - In 1997 the World Health Organization estimated that nearly 700,000 deaths are related to air pollution and that about 8 million avoidable deaths will occur worldwide by 2020. Cifuentes, Luis, et al., "*Climate Change: Hidden Health Benefits of Greenhouse Gas Mitigation*", Science Magazine, August 17, 2001, vol. 293: 1257-1259 at p. 1.

      - Rebuttal: It is impossible from the above statistics to determine the extent to which the installation of a local wind power facility will offset those impacts, or how those offsets might compare with other potential local impacts (such as nuisance, safety, and health) discussed throughout this report.

- According to Leventhall, infrasound and its companion low frequency noise now occupy a special position in the national psyche of a number of countries where they lie in wait for an activation trigger to re-generate concerns of effects on health. Earlier triggers have been defense establishments and gas pipelines. A current trigger is wind turbines. Leventhall, Geoffrey, "*How the 'Mythology' of Infrasound and Low Frequency Noise related to Wind Turbines Might Have Developed*", First International Meeting on Wind Turbine Noise: Perspectives for Control, October 17-18, 2005.

Measurement of Wind Turbine Noise

- Different WTSG members felt that the following information was relevant and informative:
  - Some, but not all, WTSG members offered the following:
    - Low-frequency noise is not adequately measured using an "A-weighted" sound measurement (dBA). A-weighted measurements underestimate the levels of low-frequency noise. Leventhal, *Review of Published Research on Low-Frequency Noise and Its Effects* at 8.2.4 (2003) (prepared for British Department for Environment, Food, and Rural Affairs (DEFRA)). Since A-weighting underestimates the sound pressure of noise with low-frequency components, a better assessment of health effects would be to use C-weighting. Frey and Hayden, "*Noise Radiation from Wind Turbines Installed Near Homes: Effect on Health*", 2007 at p. 36, *quoting* World Health Organization Guidelines for Community Noise S.3.8 (1999). Both A- and C-weighted measurements are necessary to adequately assess noise from wind turbines. James, Richard, E-Coustic Solutions, "*Champaign County Ohio Noise Questions Powerpoint Presentation*", February 6, 2008.
      - Rebuttal: The Leventhall review cited above is a thorough examination of low frequency noise from a variety of sources. It is recognized that low frequency noise can be an issue in some higher sound level environments, and that using an A-weighted measurements can be inadequate in those environments. This report, however, does not focus on wind turbine noise, and Leventhall has reported repeatedly that low frequency sound at the levels produced by wind turbines is not problematic. Leventhall, "*How the "mythology" of infrasound and low frequency noise related to wind turbines might have developed",* First International Meeting on Wind Turbine Noise: Perspectives for Control, October 17-18, 2005 at p. 13-14; British Wind Energy Association, "*Low Frequency Noise and Wind Turbines, Technical Annex*", February 2005 at p. 2.
  - Other WTSG members offered the following:
    - Low frequency sound from wind turbines is comparable to natural ambient levels of low frequency sounds. Leventhall, Geoffrey, "*How the 'Mythology' of Infrasound and Low Frequency Noise related to Wind Turbines Might Have Developed*", First International Meeting on Wind Turbine Noise: Perspectives for Control, October 17-18, 2005, at p. 13-14. According to Sondergaard, "It seems that there is no tendency that the larger wind turbines is [sic] creating an excessive amount of low frequency noise compared to the overall noise level." Sondergaard, Bo & Hoffmeyer, Dan,

"*Low Frequency Noise from Large Wind Turbines*", Second International Meeting on Wind Turbine Noise, September 20-21, 2007 at p. 21. Measuring the C-weighted component of wind turbine noise will not help mitigate sound impacts in communities. The C-weighted measurement is generally only useful for environmental sound when the absolute magnitude exceeds about 70-75 dBC. Below this threshold low frequency sound is largely imperceptible and inconsequential. Hessler, David, Hessler Associates, Inc., Speerschneider, Michael, Everpower Renewables Corp., "*Comments in Response to Richard James Presentation*", March 3, 2008.

- Yet other WTSG members offered the following:
  - At the present time there are no common international noise standards or regulations for sound pressure levels. Rogers, Anthony, PhD, et al., "*Wind Turbine Acoustic Noise*", Renewable Energy Research Laboratory, June 2002, Amended January 2006 at p. 21.
  - Sample Noise Assessment for a Wind Turbine Project, taken from Rogers, Anthony, PhD, et al., "*Wind Turbine Acoustic Noise*", Renewable Energy Research Laboratory, June 2002, Amended January 2006 at p. 22.

    1. An estimation or survey of existing ambient background noise levels.
    2. Prediction of noise levels from the turbines at and near the site.
    3. Identification of a model for sound propagation (sound modeling software will include a propagation model)
    4. Comparing calculated sound pressure levels from wind turbines with background sound pressure levels at the locations of concern.

Mitigation of Wind Turbine Noise:

Different WTSG members felt that the following information was relevant and informative:

- Some, but not all, WTSG members offered the following:
  - Efforts to reduce potential noise impacts on nearby residents may be most important within one-half mile. National Research Council, *"Environmental Impacts of Wind-Energy Projects"*, May 2007 at p. 153.
    - Rebuttal: While it has been suggested that potential noise on nearby residents may be less important outside of ½ mile, this does not indicate that noise impacts *will be* important within ½ mile.

Recommended Action:

- The Wind Turbine Study Group recommends a noise standard +5dB above pre-construction background (L_{90}) to mitigate potential noise impacts from wind turbines in Champaign County. Wind turbine noise should not cause the sound levels at any receptor site to exceed 5 decibels

above pre-construction background (L_{90}). This standard should be used in siting determinations as well as to assess ongoing operation of wind turbines.

- Some, but not all, WTSG members recommend that a standard include a threshold level of 40-45 dB (based on World Health Organization (WHO) community sound guidelines which recommend sound levels outside a bedroom do not exceed 45 dB to avoid sleep disturbance). If the sound from turbines exceeds this level, the limit should be +5dB above pre-construction background (L_{90}). The sound standards referenced above are designed to minimize possible adverse impact to residents in their homes and are much more stringent than typical outdoor noise standards. It would be appropriate, therefore, to maintain these standards at the residence and not at other parts of the property. The National Research Council study recommends that good practice for dealing with potential impacts of noise includes maintaining a minimum distance between the nearest turbine and a residence. National Research Council, *"Environmental Impacts of Wind-Energy Projects"*, May 2007 at p. 176.

    - Some, but not all, WTSG members believe that the proposed noise standard threshold of 40-45 dB is unacceptable because—

        - It would allow wind turbine facilities to significantly increase community noise levels to, or above, the 30 dB threshold for sleep deprivation as recognized by the WHO, *see* Frey and Hayden, "*Noise Radiation from Wind Turbines Installed Near Homes: Effect on Health*", 2007 at p. 34;

        - The WHO has recognized that a lower limit is appropriate where there is a significant low-frequency noise component or where a throbbing or pulsating noise is present (all of which are present in wind turbine noise), Frey and Hayden, "*Noise Radiation from Wind Turbines Installed Near Homes: Effect on Health*", 2007 at p. 35; and James, Richard, E-Coustic Solutions, "*Champaign County Ohio Noise Questions Powerpoint Presentation*", February 6, 2008 at slide 33, and

        - High levels of public annoyance have been documented at wind turbine noise levels above 40 dB. Pedersen, Eja, *Noise Annoyance from Wind Turbines—A Review,* 2003 at p. 13.

    - Some, but not all, WTSG members state that the WHO guideline for community noise related to sleep disturbance of 30 dB described above applies *inside the bedroom*. The same guideline indicates that sound pressure level of 45 dB at the outside façade, with an open window, is adequate to prevent sleep disturbance. Frey and Hayden, "*Noise Radiation from Wind Turbines Installed Near Homes: Effect on Health*", 2007 at p. 35.

- Some, but not all, WTSG members recommend that compliance with wind turbine noise standards be determined using both A- and C-weightings.

    - Some, but not all, WTSG members believe that measuring the C-weighted component of wind turbine noise will not help mitigate sound impacts in communities. Below the absolute magnitude of 70 or 75 dBC, low frequency sound is largely imperceptible and inconsequential. Hessler, David, Hessler

Associates, Inc., Speerschneider, Michael, Everpower Renewables Corp., *"Comments in Response to Richard James Presentation"*, March 3, 2008, at p. 2.

- The WTSG recommends that wind turbine noise standards be implemented as follows:
  - The L_{90} sound level is a background noise measurement representing that sound level which is exceeded 90 percent (90%) of the time.
  - The background level should be established by a qualified and experienced sound engineer.
    - Some, but not all, WTSG members recommend that background noise samples should be at least 10 minutes in length. Background noise should be measured during late evening or nighttime conditions using pre-construction computer modeling to determine representative receptor sites. James, Richard, E-Coustic Solutions, *"Champaign County Ohio Noise Questions Powerpoint Presentation"*, February 6, 2008 at slides 37, 47.
  - Compliance with the L_{90}+5dB standard should be evaluated through computer modeling as a part of pre-construction project review and approval. This modeling should be based in part on an IEC certified sound power level that represents the sound level originating from the turbine. A qualified sound engineer should then use that sound power level, along with the characteristics of the project area to model the sound propagation through the proposed project area. The modeled sound impact at any particular spot should be evaluated against the noise standard recommended above.
  - Modeling sound from wind turbines and predicting its impact in the community is complicated by the varying noise levels from both the wind turbine and the ambient background noise that will mask the turbine noise. A qualified sound engineer experienced in modeling wind turbine sound should be utilized for this study.
  - Some, but not all, WTSG members recommend that compliance should be determined at the property lines of adjacent non-participating landowners. Determining compliance at existing residences and businesses does not take into account the potential for future development of adjacent parcels.
  - Some, but not all, WTSG members state that the sound standards referenced above are designed to minimize possible adverse impact to residents in their homes and are much more stringent than typical outdoor noise standards. It would be appropriate, therefore, to maintain these standards at the residence and not at other parts of the property. The National Research Council study recommends that good practice for dealing with potential impacts of noise includes maintaining a minimum distance between the nearest turbine and a residence. National Research Council, *"Environmental Impacts of Wind-Energy Projects"*, May 2007 at p. 176.
  - If multiple turbines are proposed, their combined noise effects on neighboring properties should be considered as part of the computer modeling. Computer models should reflect conservative assumptions for operating conditions and meteorological conditions. All assumptions should be disclosed in the modeling report.
  - WTSG members had differing views as to the recommended methods to be used to assess compliance with wind turbine noise standards.

- Some, but not all, WTSG members recommend that compliance with the recommended noise standard should be assessed using both dBA and dBC measurements and in accordance with American National Standards Institute (ANSI) Standards S12.9, S12.17, and S12.18.

- These members further state that because low-frequency noise from wind turbines is audible under certain circumstances, it should be measured by use of C-weighted noise measurements.

- Some, but not all, WTSG members recommend using appropriate methods used by the acoustic engineering industry working in the field of community sound impacts of wind energy projects. These members believe that there are a number of acceptable methodologies that are employed to measure compliance, that the ANSI standards listed above are not specific to wind turbine sound measurements, that it is not clear that they would be appropriate for all situations, and that they should not be adopted without further examination of their appropriateness.

- Some, but not all, WTSG members recommend that local decision-makers should assess from the developer a project application fee sufficient to enable the township to engage its own noise consultant for assessing sound modeling and future operational compliance with the sound standard.

10. Road Infrastructure:

Definition of Issue: The road infrastructure must physically support both traffic patterns and loads associated with wind turbine installation projects.

Information Assessment:

- Construction of the project will require heavy traffic and overweight carriers. This traffic will create temporary congestion in some areas and local roads may be damaged. Oversight of road infrastructure is within the purview of the Champaign County Engineer and necessary regulations, permitting and oversight are currently in place to protect local highway infrastructure during construction.

- The Champaign County Engineer requires any activity under special permit for oversized/over-load to submit a transportation plan, engineered road assessments, and completion of adequate roadway improvements before work can begin.

- Some roadway and intersection upgrades will likely be necessary. Again, the Champaign County Engineer would oversee this work to ensure that it is done properly.

Recommended Action:

- Local decision-makers should request a transportation route and work with the developer to make sure the community and school districts are aware of activity on local roads.

- Prior planning with the developer and county engineer or township trustees is imperative. Prior to construction the developer should provide a turbine site plan and transportation route associated with construction of the project.

- The roads after the construction should be as good as or better than they were previously.

- The Natural Resource Conservation Service has "best management practices" that have been written to mitigate negative impacts to the environment, and must be considered.

11. Shadow Flicker:

Definition of Issue:

- Shadow flicker describes the effect caused by wind turbine blades passing between the sun and an observer. Rotation of turbine blades in sunny conditions results in moving shadows on the ground, which results in alternating changes in light intensity. Shadow flicker is different from a related strobe-like phenomenon that is caused by intermittent chopping of the sunlight behind the rotating blades. Shadow flicker is a function of several factors, including the location of people relative to the turbine, the wind speed and direction, the diurnal variation of sunlight, the geographic latitude of the location, the local topography, and the presence of any obstructions. National Research Council, *"Environmental Impacts of Wind-Energy Projects"*, May 2007 at p. 160. Shadow flicker is also a function of tower height and rotor diameter.

Information Assessment:

- According to the National Research Council, shadow flicker is not important at distant sites (for example, greater than 1,000 feet from a turbine) except during the morning and evening when shadows are long. However, sunlight intensity is also lower during the morning and evening when shadows are long. This tends to reduce the effects of shadows and shadow flicker. National Research Council, *"Environmental Impacts of Wind-Energy Projects"*, May 2007 at p. 160.

- Turbines on elevated ridges may cast very long shadows into the adjacent valleys. For example, for a 700' high north-south ridgeline and a 262 foot nacelle, the 300' diameter rotors will cast over a two-mile shadow when the sun is at 5 degrees. Bolton, R.H., *"Evaluation of Environmental Shadow Flicker, Analysis for 'Dutch Hill Wind Power Project"*, January 30, 2007 at p. 9. Although 700' ridgelines are not representative of topography in Champaign County, Ohio, this example illustrates how topography can affect the length of shadows cast by wind turbines. The length of the shadow and potential exposure to shadow flicker should be calculated based on local topography.

    - Some, but not all, WTSG members believe that since elevation changes in Champaign County, Ohio, are roughly 200' with much more gradual slopes than those used in the calculations referenced in the Bolton example above, the above example does not provide an accurate representation of potential impacts in Champaign County, Ohio.

- According to the National Research Council, while shadow flicker can be a nuisance to people living near a wind-energy project, in the United States shadow flicker has not been identified as causing even a mild annoyance. National Research Council, *"Environmental Impacts of Wind-Energy Projects"*, May 2007 at p. 160.

    - In Northern Europe because of the higher latitude and the lower angle of the sun, especially in winter, shadow flicker can be a problem. National Research Council, *"Environmental Impacts of Wind-Energy Projects"*, May 2007 at p. 160.

- Some, but not all, WTSG members believe that the experience with shadow flicker in the United States may be different from that in Europe because large wind-energy facilities in populated areas are relatively new in the United States.

- According to one publication, people and animals (for example, dairy cattle) directly under the shadow flicker cast by a bright sun will both be highly affected by shadow flicker from wind turbines by the rapid dimming and brightening. This has not been experienced by most people or livestock ever before and will be a completely new phenomenon. Bolton, R.H., *"Evaluation of Environmental Shadow Flicker, Analysis for 'Dutch Hill Wind Power Project"*, January 30, 2007 at p. 10.

  - Some, but not all, WTSG members feel that the Bolton statement above is opinion and not based on science, expertise, or experience. These members are not aware of any evidence of negative impact to livestock associated with shadow flicker from wind turbines around the world. Other than the report referenced above, according to Mr. Bolton's statement of experience, his experience in wind industry is limited to one analysis of wind turbine noise of unknown content or influence. The report referenced above is an evaluation of shadow flicker assessment made by another firm.

  - Some, but not all, WTSG members note that the author of the Bolton report has at 23 years of professional experience as a project engineer (Eastman Kodak) and physics faculty member (Rochester Institute of Technology). Mr. Bolton has prepared evaluations concerning at least two wind power facilities. Furthermore, these members assert that the determination whether shadow flicker may constitute a nuisance is determined by what a reasonable person would consider an unacceptable impact, and is not solely a scientific matter.

- To the WTSG's knowledge, there are no U.S. or global uniform standards for mitigation of shadow flicker. In Denmark, it is generally recommended that there be no more than 10 hours per year when shadow flicker is experienced. One wind-energy project in Germany is subject to a restriction of 30 hours per year of shadow flicker on a neighbor's property; that restriction pertains to hours when the neighboring residents are present and awake. National Research Council, *"Environmental Impacts of Wind-Energy Projects"*, May 2007 at p. 161. The NRC publication does not specify the underlying assumptions and methodologies used in the Denmark and Germany examples cited above.

- It is sometimes difficult to work in a dwelling if there is shadow flicker on a window. Even in the worst situations, shadow flicker only lasts for a short time each day, rarely more than a half hour. National Research Council, *"Environmental Impacts of Wind-Energy Projects"*, May 2007 at p. 161.

  - Some, but not all, WTSG members also believe that shadow flicker can be a nuisance outside of a residence, for example, in outdoor recreation contexts.

- If a turbine is close to a highway, the movement of the large rotor blades and possible resulting shadow flicker can also distract motorists. National Research Council, *"Environmental Impacts of Wind-Energy Projects"*, May 2007 at p. 161. A recent compilation of wind industry related accidents reports that three fatalities have been attributed to driver distraction on a circular

road in Germany where turbines become visible to drivers. Craig, David, *Wind Turbine Accident Compilation* (enclosed in 12/11/07 materials compiled by Champaign County Farm Bureau). Because of the potential for driver distraction, Irish guidelines recommend that turbines be set back from roadways at least 300 meters. National Research Council, *"Environmental Impacts of Wind-Energy Projects"*, May 2007 at p. 161.

- Some, but not all, WTSG members feel that motorists are subject to a number of distractions when driving. There is no evidence that distance of the turbine from the road can increase or decrease the potential for distraction.

Recommended Action:

- Shadow flicker impacts should be mitigated through proper turbine siting. The wind turbine developer should provide an analysis of the potential shadow flicker impacts for the entire project. The analysis should be performed by a qualified professional and should include the use of an accepted software tool specifically designed for shadow flicker calculations. In general, shadow flicker models have the ability to consider local weather conditions, tree cover, and other factors that can determine potential exposure to shadow flicker. These models can also calculate maximum possible exposure given full sunlight without clouds.

- Local decision-makers should establish reasonable exposure limits for shadow flicker. These exposure limits should be clearly defined, and compliance should be determined during the siting process by use of the software tools referenced above.

  - Some, but not all, WTSG members believe that there is minimal potential for shadow flicker impact and it is limited to residences. Therefore, any limits for shadow flicker should be calculated based on real exposure to residences. Any calculation of exposure time should take into account scientific data and base calculations on our specific area and latitude of Champaign County, Ohio.

- Some, but not all, WTSG members recommend that to mitigate potential nuisance to people and animals and adverse property value impacts on adjacent property, any restriction on shadow flicker impacts should be measured from boundaries of adjacent properties. These members recommend that shadow flicker modeling should be based on maximum possible exposure given full sunlight without clouds. These members also recommend that a 10 hour/year exposure standard, similar to the Danish guideline referenced above, is reasonable and appropriate under any scenario.

12. Telecommunications:

Definition of Issue:

- Wind turbines have the potential to interfere with television, radio, microwave/radio fixed links, cellular phones, and radar transmissions. National Research Council, *"Environmental Impacts of Wind-Energy Projects"*, May 2007 at p. 160.

Information Assessment:

- The main form of interference to TV transmission caused by wind-energy projects is the scattering and reflection of signals by the turbines, mainly the blades. In relation to the components that make up a wind turbine, the tower and nacelle have very little effect on reception (that is, only a small amount of blocking, reflection, and diffraction occurs.) National Research Council, *"Environmental Impacts of Wind-Energy Projects"*, May 2007 at p. 170.

- Available literature indicates that the effects of wind projects on both AM and FM radio transmission signals are considered to be negligible and only apply at very small distances from the turbines (that is, within tens of meters). National Research Council, *"Environmental Impacts of Wind-Energy Projects"*, May 2007 at p. 171.

- A wind turbine may degrade the performance of fixed link radio receivers (like satellite dishes), not only if the turbine is within the line of site of the link but also if it is within a certain lateral distance of the link, known as the "Fresnel zone." National Research Council, *"Environmental Impacts of Wind-Energy Projects"*, May 2007 at p. 171.

- The potential for interference of wind turbines with radar is only partially understood. If there is such interference, it would primarily affect military and civilian air-traffic control and National Weather Service weather radar. National Research Council, *"Environmental Impacts of Wind-Energy Projects"*, May 2007 at p. 171-72. As of late 2006, the interference of wind turbines with radars is a problem as yet unsolved. National Research Council, *"Environmental Impacts of Wind-Energy Projects"*, May 2007 at p. 173.

Recommended Action:

- Local decision-makers should require sufficient information about the potential for telecommunications and radar interference during siting and compliance review of proposed wind-power developments, and should require prompt mitigation of any such interference post-installation.

13. Turbine Collapse:

Definition of Issue:

- As a built structure, a wind turbine may collapse under extreme conditions, operator error or manufacturing defect.

Information Assessment:

- Published literature suggests that turbine tower failure is rare, but these accidents do occur. Craig, David, *Wind Turbine Accident Compilation*.

Recommended Action:

- In connection with pre-construction review and approval of wind power developments, local decision-makers should address this issue with the use of property line, utility line, and roadway setbacks of at least the height of the hub plus the rotor radius. This would ensure that if the turbine structure does fail, it would not damage occupied structures, roadway rights-of-way, or adjacent nonparticipating properties. Also, it would be appropriate to limit access in the immediate area of the wind turbine during testing and inspection procedures. The design and construction of the wind energy project should conform to all applicable industry standards and developer/operator should provide certification of design compliance.

14. Vandalism:

Definition of Issue:

- There may be a community concern that vandals would seek to damage the turbine, which could result in a safety concern.

Information Assessment:

- The industry standard for wind turbines is a monopole design with operating components located inside the rolled-steel tower and secured behind a locked metal door.

Recommended Action:

- According to the particular landowner's desire, gates can be installed at the access roads to help prevent unauthorized persons from entering a property.

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END

Appendix B

Assistant Prosecutors:

Juvenile Division
Lori L. Reisinger

Civil Division
Scott D. Schockling
Richard L. Houghton, III

Victim/Witness Division
Peggy L. Baker
Jean A. Erickson

Office Administrator
Sandi G. Perry

NICK A. SELVAGGIO
Prosecuting Attorney of Champaign County
Champaign County Courthouse
200 North Main Street
Urbana, Ohio 43078
Phone: (937) 484-1900
Fax: (937) 484-1901

April 22, 2008

Nick A. Selvaggio
Champaign County Prosecuting Attorney
200 North Main Street
Urbana, Ohio 43078

Re: Township Authority to Require Decommissioning Bonding or Funding for Wind Turbine Projects; C.C.Op. 08-006

QUESTION PRESENTED

The wind turbine study group has asked whether townships have the statutory authority to require "decommissioning bonding or funding." Decommissioning is the act of dismantling and removing a wind turbine at the end of its useful life or when it is deemed unsafe.

SHORT ANSWER

Since multiple agencies have jurisdiction over the generation and transmission of electrical power, the answer to this question is largely dependent upon who owns or operates the wind turbine or wind farm and its generating capacity.

DETAILED ANSWER

A township is a creature of statute, possessing only the powers it is granted by statute, either expressly or by necessary implication.[1] Thus, a board of township trustees may only exercise the powers expressly conferred by statute and the powers that must necessarily be implied from those express powers to enable the trustees to perform the duties imposed upon them. With that principle in mind, this opinion will briefly discuss several possible scenarios involving the decommissioning of wind turbines and wind farms.

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[1] E.g., *Hopple v. Trustees of Brown Township,* 13 Ohio St. 311, 324 (1862).

a. Public Utilities

Revised Code Chapter 519, the statute authorizing townships to enact zoning resolutions, exempts public utilities from its scope. In that regard, R.C. 519.211(A) states:

> Except as otherwise provided in division (B) or (C) of this section, sections 519.02 to 519.25 of the Revised Code confer no power on any board of township trustees or board of zoning appeals in respect to the location, erection, construction, reconstruction, change, alteration, maintenance, removal, use, or enlargement of any buildings or structures of any public utility or railroad, whether publicly or privately owned, or the use of land by any public utility or railroad, for the operation of its business.[2]

As this language makes clear, if a wind turbine or wind farm is erected by a public utility, regardless of its generating capacity, it is exempt from township zoning.[3]

However, to the extent that a wind turbine or wind farm qualifies as a "major utility facility,"[4] the Power Siting Board has jurisdiction over its siting. The hearing procedures used by the Power Siting Board allow for public comment, a forum where the decommissioning issue might be raised. With regard to electrical generating facilities that do not qualify as a "major utility facility," the Public Utilities Commission has jurisdiction and its rules might also allow for public comment. Otherwise, it appears that a township can only address the "decommissioning" of wind turbines and wind farms owned or operated by public utilities via R.C. 505.86, the general nuisance statute governing unsafe buildings and structures.[5]

b. Major Utility Facilities

If a wind turbine or wind farm is erected by an entity that does not qualify as a public utility, it might still be exempt from township zoning. Revised Code Chapter 4906 sets forth a comprehensive scheme governing the process for applying for and granting

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[2] Division (B) allows townships to regulate telecommunication towers in areas zoned for residential use. Division (C) allows limited regulation over public utilities engaged in the business of transporting personas or property over any public street, road, or highway. Neither division has any application to electric generating and distribution facilities.

[3] *A & B Refuse Disposers, Inc. v. Ravenna Twp. Bd. of Trustees* (1992), 64 Ohio St.3d 385, defines "public utility" for purposes of township zoning. A discussion of the characteristics of a "public utility" is beyond the scope of this opinion.

[4] An electric generating facility with a capacity of 50 megawatts or more qualifies as a "major utility facility." See R.C. 4906.01(B)(1).

[5] R.C. 505.86 allows boards of township trustees to provide for the removal, repair, or securance of buildings or other structures that have been declared insecure, unsafe, or structurally defective by any fire department, county building department, or board of health.

certificates to construct major utility facilities, including electric generating plants designed for, or capable of, operation at a capacity of 50 megawatts or more.[6]

More specifically, R.C. 4906.13 provides:

> No public agency or political subdivision of this state may require any approval, consent, permit, certificate, or other condition for the construction or initial operation of a major utility facility authorized by a certificate issued pursuant to [this chapter]. . . . Nothing herein shall prevent the application of state laws for the protection of employees engaged in the construction of such facility nor of municipal regulations that do not pertain to the location or design of, or pollution control and abatement standards for, a major utility facility for which a certificate has been granted under this chapter.

The first sentence of R.C. 4906.13 wholly exempts the siting of major utility facilities from local regulation.[7] The second sentence allows for limited regulation by villages and cities. This sentence makes no provision for townships, however. Therefore, a township has no authority to impose any condition, including the posting of a decommissioning bond or plan, on the construction or initial operation of a major utility facility.

It should also be noted that the jurisdiction of the Power Siting Board is not dependent upon whether the "major utility facility" is owned or operated by a public utility. In that regard, R.C. 4906.04 provides in part:

> No person shall commence to construct a major utility facility in this state without first having obtained a certificate for the facility [from the Power Siting Board]. . . .

R.C. 4906.01(A), in turn, defines a "person" as "an individual, corporation, business trust, association, estate, trust, or partnership or any officer, board, commission, department, division, or bureau of the state or a political subdivision of the state, or any other entity." This definition of "person" includes anyone wishing to construct a major utility facility, without regard to whether they are a public utility.

Furthermore, if multiple wind turbines are connected together and enter the grid at a single point, this office believes that their generating capacities should be aggregated, for purposes of determining whether the project qualifies as a "major utility facility." If the aggregate capacity is 50 megawatts or more, a township would have no authority to condition the operation of a wind turbine or wind farm on the posting of a decommissioning bond or plan.

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[6] E.g., *State ex rel. State Edison Co. v. Parrott* (1995), 73 Ohio St.3d 705, 707.

[7] *Parrott*, 73 Ohio St.3d at 707, 709; *Chester Township v. Power Siting Comm.* (1977), 49 Ohio St.2d 231, 234

Rather, the siting procedure set forth in Revised Code Chapter 4906 and the accompanying administrative rules make provision for public comment. This forum may allow township officials or residents to address the decommissioning issue. Otherwise, it appears that a township's only authority regarding the decommissioning of wind turbines or wind farms with a generating capacity of 50 megawatts or more is R.C. 505.86.

c. Agricultural Use

Wind turbines used primarily to generate electrical power for agricultural activities might also be exempt from township zoning. In that regard, R.C. 519.21(A) provides in part:

> Except as otherwise provided in division (B) of this section, sections 519.02 to 519.25 of the Revised Code confer no power on any township zoning commission, board of township trustees, or board of zoning appeals to prohibit the use of any land for agricultural purposes or **the construction or use of buildings or structures incident to the use for agricultural purposes of the land on which such buildings or structures are located**[.] . . .

(emphasis added).

For purposes of R.C. 519.21(A), a structure is "incident to the use for agricultural purposes of the land" where the structure is directly and immediately related to an agricultural use, or is usually or naturally and inseparably dependent upon an agricultural use.[8] In light of this test, wind turbines that generate electricity that is used for agricultural purposes would appear to be directly and immediately related to an agricultural use, and therefore, exempt from township zoning. If so, a township would have no authority to require the posting of a decommissioning bond or plan as a condition for the wind turbine's erection. Of course, if the wind turbine is abandoned, and therefore no longer used for agricultural purposes, the township would be able to address its removal via the process set forth in R.C. 505.86.

d. Non-Major Utility Facilities Owned or Operated by Non-Public Utilities

Notwithstanding the broad exemptions provided by Revised Code Chapters 519 and 4906 of the Revised Code, some wind turbines and wind farms might still be subject to township zoning. For example, wind turbines and wind farms owned or operated by non-public utilities with a generating capacity under 50 megawatts cannot avail themselves of either the public utility exemption or the major utility facility exemption. Such facilities may be subject to township zoning resolutions. Similarly, small-scale wind turbines intended for personal use might be subject to township zoning.

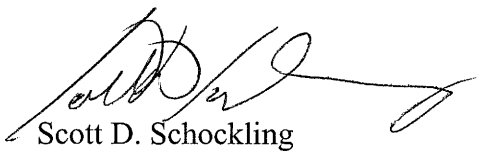
In such cases, a township, as part of the authority granted by Revised Code Chapter 519, may require the posting of a decommissioning bond or plan. A number of

[8] E.g., *State v. Huffman* (1969), 20 Ohio App.2d 263, 269-70.

townships in Champaign County pursuant to their authority to regulate telecommunication towers in areas zoned for residential use have required bonds or decommissioning plans to be posted as part of the permitting process.

Sincerely yours,

NICK A. SELVAGGIO, CHAMPAIGN COUNTY PROSECUTING ATTORNEY



Scott D. Schockling
Assistant Prosecuting Attorney

cc: file