Hamlin Wind Study Committee Report

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Introduction

In January 2007, the Town Board of the Town of Hamlin selected a Citizens Committee comprised of 9 residents, to facilitate the gathering, compilation and understanding of available information on industrial wind turbines. In March 2007 the town enacted a moratorium on the potential installation and operation of a wind farm in the Town of Hamlin. This moratorium was enacted to allow the town to take the time necessary to understand as fully as possible the ramifications of the placement of industrial wind turbines within the town. Within this report are the findings of the Citizens Committee including currently available information, responses to specific questions, and recommendations.

1. Citizens Committee

The Citizens Committee was composed of the following residents:

Linda DeRue- Chairperson,
Mark Reeves, Andy Simpson, Tom Jensen, Lester Wilson, Stan Lyons, Jerry Berkholder, David Lukas, and Linda Morey with Edward Evans (resigned), Edward Haight (resigned), Glen Quackenbush (resigned) and Art McFarlane(resigned).

Special thanks to Heather Norman, Recording Secretary

2. Wind Tower Committee Charter

Mission Statement:

The mission of the Wind Tower Committee is to determine if wind towers are in the overall best interest of the Town of Hamlin and to develop proposed regulations accordingly.

Objectives:

- Determine what constitutes “best interest of the Town.”
- Assess the general Town opinion regarding wind energy.
- Determine how wind towers can contribute to the Town.
- Communicate with and visit other municipalities with wind towers.
- Research and identify benefits associated with wind towers and determine how to optimally maximize and distribute the benefits.
- Research and identify negatives associated with wind towers and determine how to mitigate same.
- Identify impact of wind towers and wind tower construction on infrastructure, e.g., protection of road ways, underground lines, landscaping, wells, etc.
- Develop proposed regulations on wind towers which conform to and reflect the best interests and desires of the Town and submit to Town Board.

Chairperson:

A chairperson will be selected by the committee at the first meeting. The chairperson will:

- Facilitate and conduct the meetings of the committee.
- Schedule additional meetings and form sub-committees as necessary.
- Be a voting member of the committee.
- Be authorized direct liaison with the Town Supervisor.
- Be provided with assets as necessary and affordable to complete assigned

committee responsibilities, including access with consultants, engineers and/or attorneys. Town Board approval will be required on all contracted items.
- Follow-up on assigned responsibilities.
- Schedule and develop an agenda for meetings based on member input.
- Prepare a monthly report of the committee's accomplishments, difficulties encountered and recommendations for Town Board.
- Ensure the effectiveness of the meeting by directing discussions to meet mission and objectives.
- Designate a co-chairperson and other "officer" positions as desired, including a recorder.

Meetings:

- Meetings will initially be held monthly, on the third Tuesday of each month starting at 7 p.m. in the Town Hall Board Chambers.
- Special or additional meetings of the committee may be called by the Chairperson upon his/her initiative, or upon the request of at least five (5) members.
- Additional/special meetings must be scheduled with the Town Clerk and publicly announced.
- Meetings will be open to the public. After the initial, organizational meeting, a minimum of one Public Forum will be held at each meeting. The Public Forum may be conducted at the beginning or at the end of each meeting, as desired by the Chairperson.

Quorum:

A quorum for the conduct of business at each meeting shall be a simple majority of the committee members.

Target Completion Date:

December 2007.

3. Scope

The scope of this study is limited to commercial wind turbines (and associated equipment). The primary purpose of these commercial wind turbines is to generate electricity for commercial sale.

4. Roadway and Residence Densities and Setbacks in Hamlin

Roadway and residence densities are shown on two maps in Appendix A. These were generated by the Monroe County Department GIS. Included with these maps are setbacks or buffers based on incremental distances of 1500 feet from roadways and 2640 feet from existing dwellings.
These maps are included to aid in estimating potential locations for the siting of commercial wind turbines. The siting of wind turbines is typically restricted by the potential adverse impacts they may have on established features of the nearby areas, most commonly roadways or residences. Many potential adverse impacts are mitigated by establishing suitable setbacks, or distances between wind turbines and roadways or residences. Recommended or example setback distances are discussed in some of the following chapters.

5. Economics

The State of New York has recently renewed a real property tax exemption for renewable energy systems, Real Property Tax Law (RPTL) 487, which includes commercial wind turbines. This exemption is for a period of 15 years after installation during which time the property is not subject to any real property tax levies. After 15 years the property would be subject to regular tax levies. Although these exemptions are state-enacted, they can be disallowed at the local level, in which the county, town or school district may vote to disallow the exemption. This is stated in the Assessor's Manual Vol. 4. - section 487. The Town Fire Department would not be included in this exemption.

In the event an exemption is in effect, a PILOT (Payment In Lieu Of Taxes)/Host program can be implemented to generate revenues. In Monroe County, PILOT programs would be negotiated between the Town of Hamlin and the wind turbine companies.

The Town of Hamlin assesses taxes on a 49% of full assessment basis.

The following table illustrates the current distribution of revenues based on current (2006) tax rates and the AVERAGE school tax rate. Actual distributions would vary slightly by individual school district.

Tax Type	**Rate/1000 Assessed Value**	**Percentages of Total**
Town of Hamlin	**6.27**	**8.80**
Morton Fire District	3.42	4.80
Morton Lighting	0.27	0.38
County of Monroe	14.74- Total includes all mandated portions	20.71
School (AVERAGE)	46.49 of Brockport, Kendall and Hilton	65.30

The Morton Districts were used because this is the area that has the greatest potential for

development according to the developer and the NYS wind maps. The Walker, Hamlin and Hilton- Parma fire districts could also be inserted into the tax proportionments if those areas become a consideration for future wind turbine development.

As the above table illustrates, taxes levied directly by the Town of Hamlin account for about 8.8% of the total tax burden on real property owners in the Town of Hamlin, with the greatest beneficiaries being the school districts.

For illustrative purposes, the maximum revenues from a single wind turbine based on an estimated full assessment value of $1,500,000 with no exemption would be as follows:

Tax Type	**Rate/1000 Assessed Value**	**Revenue**
Town of Hamlin	6.27	$ 4608
Morton Fire	3.42	$ 2514
Morton Lighting	0.27	$198
County of Monroe	14.74	$10834
School (AVERAGE)	46.49	$34170
TOTAL		$52,325

Since the potential area of construction is in the Morton District only the pertinent Morton data was used for the above illustration.

The direct financial gain for the Town of Hamlin would be less than $4608/year per turbine using this estimate. Payments from a PILOT program would likely be lower. This is because PILOT program payments must be divided according to the existing tax proportionment structure.

As the distribution of the commercial wind turbines across the Town of Hamlin would likely not be uniform among the various school districts, school districts would benefit financially to varying degrees or perhaps not at all. Also, it is not expected that property owners in school districts that benefit from revenues from commercial wind turbines in the Town of Hamlin will receive a corresponding reduction in school taxes as no precedents were found to support this.

If reductions in school taxes were implemented from the additional revenues from commercial wind turbines in the Town of Hamlin they would likely be uniform across the entire school district, benefiting not only Hamlin property owners in that school district but property owners outside of the Town of Hamlin as well. Those being the Hilton, Brockport and Kendall School Systems. A uniform school tax reduction to all property owners in the Town of Hamlin or exclusive to property owners in the Town of Hamlin would not be realized unless negotiated between the Town and the three school districts.

It is more likely that tax reductions could be realized for all property owners in the town of

Hamlin through reductions in County, Medicaid, Town and Fire real property taxes, of which only the Town and Fire are under the control of the Town of Hamlin.

Alternative to, or in addition to conventional taxation, also known as Incentive Zoning, may make it possible to negotiate for benefits that could be realized by the entire town, for example improvements to the infrastructure (municipal water, etc.), or reduced electricity rates. If the Town agrees to use Incentive Zoning, it is our recommendation that a public hearing be held regarding this issue since we as a committee agree, that whatever is done, it should benefit the entire town. Another option is to base payments on the energy produced by the project in the Town (cents/kWh of electricity) (1). This however may not benefit the Town of Hamlin as much as others may as the actual production (MW) will be considerably less than the stated nameplate capability.

If commercial wind turbines are placed in the Town of Hamlin, it is recommended that a full evaluation of how the financial benefits for the County and School Districts, obtained by installation of commercial wind turbines in the Town of Hamlin, can be made to uniformly benefit the Town of Hamlin as a whole prior to initiation of any wind power projects.

References:
(1) PROPERTY TAX: Exemptions and PILOT; from NYSERDA website; www.powernaturally.org
(2) Assessor's Manual. Volume 4, Exemption Administration - RPTL Section 487

6. Property Values

The monetary value of any home generally represents the main portion of a family's life savings. The value of homes within the area of the potential wind turbine complex should not be adversely affected by the project. .

7. Installation: Infrastructure Considerations

There are several aspects to the installation of commercial wind turbines and their impact on the existing infrastructure of the Town of Hamlin that were considered by the committee after a tour of the Fenner and Wethersfield projects in their respective towns. These are outlined as follows:

1. Disruption to existing traffic patterns
2. Wear and tear on existing roadways
3. Generation of dust
4. Power lines, communication lines and poles
5. Temporary and permanent access roads
6. Drainage
7. Water wells

1. Disruption to established traffic patterns

There are several facets to the installation of commercial wind turbines that will affect existing traffic patterns. Installation of access roads will require transporting heavy equipment and significant quantities of stone and gravel. Installation of wind tower bases will require transportation of significant quantities of concrete by trucks in rapid succession for each base. Each base can use as much as 400 cubic yards (about 800 tons) of concrete.

There are roads in Hamlin with high traffic levels that would likely be affected (for example Route 18, Route 19,Church and Redman Rds.). It is suggested that only the State and County maintained roads be utilized to minimize the potential impact to the roadways maintained by the Town of Hamlin. These would most likely be the roads capable of handling the very heavy construction equipment. This may require detours or restricted hours of operation to minimize the impact on traffic.

2. Wear and tear on existing roadways:

The applicant shall identify all state, county and town roads to be used within the Town of Hamlin to transport equipment, parts and materials for the construction operation and maintenance of the wind energy facility.

The applicant shall identify the weights of the equipment, parts, and materials to be transported over such roads.

The applicant or it's contractors shall obtain any state, county or town permits that are required to travel identified roads within the Town of Hamlin for over weight and wider loads.

The Town of Hamlin's engineer shall document town road conditions, prior to construction which will be paid by the applicant. The engineer shall document town road conditions again 30 days after construction is completed which will also be paid by the applicant.

Any road damage or changes in the road infrastructure caused by the applicant or it's contractors shall be restored to their preconstruction condition or better within 90 days of the end of construction, weather permitting at the applicants expense.

The applicant shall demonstrate that it has appropriate financial assurance to ensure the prompt repair of damage of roads.

3. Generation of dust

Assurances must be put in place before any construction begins that the problem will be monitored and addressed for the duration of the construction project in a manner that is compliant with local, Department of Environmental Conservation and any other appropriate agencies.

4. Power lines, communication lines and poles

Assurances should be put in place before any construction begins that disruptions in services will be minimal, not to exceed 1 hour at a time coordinated with the service providers with prior notification to all those impacted.

5. Temporary and permanent access roads

Construction and use of access roads (typically one access road/turbine) from existing roadways to the wind turbines can impact existing traffic patterns. Placement of roads should be planned to minimize disruptions and allow for safe entry and exit onto existing roadways.

6. Drainage

Drainage patterns can be affected by installation of concrete tower bases, installation of access roads, soil compaction, and other factors. Drainage patterns should be monitored during the construction of and after completion of a wind power project. Drainage issues should be addressed within 24 hours of recognition of the problem.

7. Water wells

Well performance prior to and after construction in these areas should be evaluated, with correction of problems implemented immediately after recognition of the problem. These expenses would be incurred by the wind tower company.

8. Land Usage

There are two major uses of land in the Town of Hamlin: agricultural and residential. The installation of commercial wind turbines would only be allowed in the agricultural districts.

Agricultural

If commercial wind turbines are placed in the Town of Hamlin, it is recommended that the Department of Agriculture and Markets be a required consultant for the placement of access roads to minimize the impact on the farming practices carried out on the parcel.

Residential

Wind turbine companies have suggested guidelines for the placement of commercial wind turbines based on participating and non-participating landowner property lines and the location of dwellings. Suggested distances, or setbacks, adopted were 1500 feet from property lines and roadways and 2640 feet from existing homes. These setbacks are based on both the guidelines of the National Academy of Science regarding distances that noise no longer becomes an issue as well as setbacks from other wind turbine complexes with the intent to minimize the noise impact on the neighboring households.

9. Wind Rights

If commercial wind turbines are placed in the Town of Hamlin it is recommended that proof of procurement of adequate wind rights with clarification of what constitutes adequate wind rights, and full disclosure of methods of enforcement of wind rights be presented with any wind project proposal.

10. Aesthetics

The installation of commercial wind turbines, with anticipated heights near or exceeding 400 feet from the base of the tower to the tip of the blade, will change the landscape and appearance of the Town of Hamlin. In addition to the turbines, associated equipment and buildings should be considered.

To minimize the visual impact of wind turbines and associated equipment and buildings, New York State Energy Research and Development Authority (NYSERDA) guidelines were reviewed and modified to make them appropriate for the Town of Hamlin.

If commercial wind turbines are placed in the Town of Hamlin, it is recommended that:

Wind turbines shall not be used for displaying any advertising. There should be a sign at the entrance to the access road posted with contact information available 24 hours a day and tower identification information.

Colors and surface treatments of the turbines shall minimize visual disruption.

The design of the buildings and related structures shall, to the extent reasonably possible, use materials, colors, textures, screening and landscaping that will blend the facility into the natural setting and existing environment.

The tower shall not significantly impair a scenic vista or scenic corridor as identified in, or in the spirit of, the Town's comprehensive plan.

All cable shall be buried underground.

Maximum height to be no more than 400 feet including rotor blades.

References

(1) WIND ENERGY Model Ordinance Options; from NYSERDA website; www.powernaturally.org

11. Lighting

General

In order to maintain the rural characteristics of the Town of Hamlin, lighting of wind turbines and associated equipment and buildings should be minimized.

If commercial wind turbines are placed in the Town of Hamlin, it is recommended that any wind farm project use the minimum lighting necessary for safety and security purposes and use techniques to prevent casting glare from the site, except as otherwise required by the Federal Aviation Administration (FAA) or other applicable authority (1).

FAA Requirements

FAA lighting requirements for wind turbines are specified in document AC 70/7460-1K (2). Daytime, twilight and nighttime lighting and/or marking of wind turbines is required. As daytime marking of wind turbines (painting in conspicuous colors) is contrary to aesthetic considerations, FAA requirements should be met through appropriate lighting. Options include the use of flashing white lights or a combination of red and flashing white lights, with the combination of red and flashing white lights used to reduce/mitigate environmental concerns in populated areas (Chapter 8, Section 80 in Ref 2).

Additionally, it may not be necessary to apply lighting to every turbine in a project.

If commercial wind turbines are placed in the Town of Hamlin, it is recommended that FAA requirements for lighting of individual turbines as well as the project as a whole be selected that minimize the environmental impact as well as on neighboring households and be included with any wind project proposal.

References

(1) WIND ENERGY Model Ordinance Options; from NYSERDA website; www.powernaturally.org

(2) U.S. Department of Transportation, Federal Aviation Administration, Advisory Circular AC 70/7460-1K Obstruction Marking and Lighting

12. Structural Integrity

Installation and Maintenance

There are three aspects to structural integrity that should be considered. The first is pre-installation to ensure that any unique characteristics of the area are taken into account during the tower design selection as well as associated structures. For example, do the soil and rock strata in the Town of Hamlin require any design or engineering features for the concrete bases that may be unique? These should be evaluated by an independent engineering firm.

Second, oversight or regulation of the installation process by an independent engineering

firm should be required to ensure that the installation has been properly completed and meets all safety requirements.

Local on call authorized personnel must respond within 30 minutes at all times.

Third, regular inspections by an independent engineering firm should be required to ensure the installation is being properly maintained and safe. Records documenting the history of maintenance should be delivered to the Town of Hamlin on a quarterly basis.

If commercial wind turbines are placed in the Town of Hamlin, it is recommended that wind turbine tower design and base selection be evaluated and approved, and that the installation be inspected and approved upon completion by an independent engineering firm. It is also recommended that semi-annual structural inspections be performed to help guarantee the structural integrity of the turbines is being maintained This should be performed by an independent engineering firm. This should be at the expense of the project owner. Special use permits will be required and renewed annually.

Structural Failure

There are documented failures of wind turbine structural integrity, most notably tower collapse and blade loss (1).

The potential for physical damage due to failure of the structural integrity of wind turbines can be minimized with appropriate setback distances from areas of concern (dwellings, ancillary buildings, roadways, snow mobile trails, etc.). As wind turbine dimensions are variable, setbacks should be established based on the specifications set forth in any wind project proposal as follows:

1. Tower collapse

Setbacks to mitigate the potential for damage due to tower collapse should be based on the total height of the structure plus an additional precautionary distance.

If commercial wind turbines are placed in the Town of Hamlin, it is recommended that a minimum setback of 3 times the overall height of a wind turbine tower and a blade fully extended vertically be required between a wind turbines.

2. Blade loss

A simplified explanation and calculation for determining the potential distance blades can be thrown from a wind turbine was obtained from a professor at Rutgers University (2). The characteristics of wind turbines that can impact the potential blade throw distance are the turbine tower height, the blade length and the rotation speed. The characteristics of the turbines used in the calculation, which are similar to those proposed for the Town of Hamlin, were as follows:

Tower Height: 300 feet
Blade Length: 100 feet
Rotation Speed: 20 RPM

This yields a potential blade throw distance (ignoring aerodynamics and friction) of about 1700 feet. An increase in any of the above characteristics will yield an increase in potential blade throw distance.

It should be noted that this distance would be for a fragment of the blade that has broken off the end of the blade, and not an entire blade. Blade throw distances would be shorter for longer blade fragments as their velocities would be less than for the tip of the blade (3).

As the dimensions of wind turbines are not established, calculations similar to those in Reference 2 would need to be employed to establish suitable setback distances for blade throw. Setbacks should be between a wind turbine and the following:

Roadways
Established snowmobile trails
Property lines of non-participating landowners
Parks and recreational areas

If commercial wind turbines are placed in the Town of Hamlin, it is recommended that, to mitigate the potential damage from blade throw, setback distances for wind turbines be established based on the calculation in Reference 2 that utilize the turbine tower height, blade length and maximum rotation speed as specified in any wind project proposal.

Example: Minimum setback of **1700 feet** for a turbine with a tower height of 300 feet, blade length of 100 feet and a rotation speed of 20 RPM

References

(1) PUBLIC HEALTH AND SAFETY; from NYSERDA website; www.powernaturally.org

(2) PART 1--basic kinematics, Professor Terry Matalsky, Department of Physics and Astronomy, Rutgers University (from website)

(3) Copy of E-mail communication with Professor Terry Matalsky

13. Noise

There are three sources of noise associated with commercial wind turbines:

1. Audible mechanical noise from bearings and gears in the turbine nacelle
2. Low frequency/infrasonic noise generally thought to be from turbine blades passing turbine towers
3. Audible aerodynamic noise from turbine blades passing through the air

In addition to the noise source, there are many other factors that affect noise and the perception of noise including the number of turbines, distance, wind characteristics, weather conditions, seasonal vegetation changes along with terrain characteristics and background noise (1).

Noise can, among others, disturb sleep, interfere with communications, cause hypertension, cardiovascular and psycho-physiological effects, reduce performance and provoke annoyance responses and changes in social behavior (2). These problems are not specific for wind turbines, but for noise in general. The audible range is between 20 HZ and 20 kHz. Below this level is considered inaudible

Infrasonic and low frequency noise (ILFN) noise however is considered noise below 500Hz. Noise below this level may be felt or sensed as opposed to being heard but is still has been proven to cause adverse effects in humans as well as animals. " In ILFN exposed blood vessels the media layer of blood vessel walls is greatly thickened by the increased amount of collagen.". .(2a) Vibro -Acoustic Disease is a disease directly related to the exposure of ILFN.

The National Academy of Science and World Health Organization (WHO) have guidelines for allowable noise levels (3) and distances that have been used to limit the adverse effects of noise.

1. Audible Mechanical Noise

Mechanical noise originates from the generator or transmission gear located in the turbine nacelle at the top of the turbine tower .It is not expected that this type of noise will be problematic, but the sound level from this source should be monitored as part of routine maintenance to ensure that noise levels are within recommended limits.

2. Low Frequency/Infrasonic Noise

Low frequency and infrasonic-ILFN_ (frequencies below human hearing) noise are generated when a turbine blade passes the stationary turbine tower.

The level of low frequency or infrasonic noise from wind turbines can be determined by different approaches. The latest methodology for measuring or monitoring ILFN is to use the Hz scale as opposed to comparing the "A" scale to the "C" scale. The "C" scale is considered to be the most accurate method to measure audible sound.

3. Audible Aerodynamic Noise

Audible aerodynamic noise is the “whoosh, whoosh” sound most commonly associated with commercial wind turbines. The noise is generated as the blades pass through the air. This type of noise is readily heard by humans and measured using ‘C’ weighting. Control of audible aerodynamic noise is typically done with suitable setbacks, such as those set forth in this document.

The dynamics of the audible noise from wind turbines is very complex and is dependent upon many factors including turbine size, number of turbines, distance from other turbines, general layout of a multiple turbine complex, wind velocity and dynamics, terrain characteristics and atmospheric conditions (1).

Additionally, the perception of noise can change based on the level of background noise. For example, as background noise (automobiles, farm machinery, birds, etc.) diminishes at nighttime, the noise from a turbine may sound louder because other sounds are not present to mask it. There are additional changes in noise based on seasonal changes. These changes are based on the presence or lack of vegetation as well as actual snow conditions that may either reflect or absorbs noise.

Furthermore, more recent studies on wind noise have shown that actual noise levels can exceed predicted levels when the impact of changes and extremes in wind dynamics aren’t properly accounted for (4).

A full four season - four times per day ambient sound analysis performed by an independent sound analysis firm needs to be performed before any permit can be issued for the wind tower construction. The analysis should be performed at the property lines of the adjoining residences as well as several various locations within a 2-mile radius.

The noise level should not exceed 45 dBa at the property line of non-participating landowners and shall not exceed the average ambient level by more than 4 dBa for more than 5 minutes out of any one hour period or exceed 45dBa for any time period at the property line.

It is also recommended that to ensure this requirement is met prior to installation, an assessment of any wind project proposals, inclusive of turbine type and location, be performed by an independent qualified engineering firm with an expertise in the evaluation of the acoustics of commercial wind turbines. Verification of noise levels after installation should be performed on a twice/year basis as part of routine maintenance. All costs associated with sound assessments should be at the expense of the wind project owner.

References

(1) Wind Turbine Acoustics, Harvey H. Hubbard and Kevin B. Shepherd, NASA Technical Paper 3057, December 1990

(2) Occupational and community noise, World Health Organization, Fact sheet No. 258, Revised February 2001

(2a) Public Health and Noise exposure : the importance of low frequency noise-

(3) Guidelines for Community Noise, Birgitta Berglund, Thomas Lindvall and Dietrich H Schwela, World Health Organization, 1999

(4) The Beat is Getting Stronger: The Effect of Atmospheric Stability on Low Frequency Modulated Sound of Wind Turbines, G.P. van den Berg, Journal of Low Frequency Noise, Vibration and Active Control, Volume 24, Number 1, 2005

(5) Notes on Low Frequency Noise from Wind Turbines with special reference to the Genesis Power Ltd Proposal, near Waiuku NZ, Dr. Geoff Leventhall, June 4 2004

(6) Acoustic Noise Generated by Wind Turbines, Oguz A. Soysal, Ph.D., Presented at the Lycoming County, PA Zoning Board Hearing on 12/14/2005

(7) Night time noise guidelines, World Health Organization Regional Office for Europe

14. Ice Throw

Ice throw can occur when ice that has built up on wind turbine blades is released as the blades rotate. The rotation of the blades can cause the ice to be thrown, rather than simply fall from the blades.

A simplified explanation and calculation for determining the potential distance ice can be thrown from a wind turbine was obtained from a professor at Rutgers University (1). The characteristics of wind turbines that can impact the potential ice throw distance are the turbine tower height, the blade length and the rotation speed. The characteristics of the turbines used in the calculation, which are similar to those proposed for the Town of Hamlin, were as follows:

Tower Height: 300 feet
Blade Length: 100 feet
Rotation Speed: 20 RPM

This yields a potential ice throw distance (ignoring aerodynamics and friction) of about 1700 feet. An increase in any of the above characteristics will yield an increase in potential ice throw distance.

As the dimensions of wind turbines are not established, calculations similar to those in Reference 1 would need to be employed to establish suitable setback distances for ice throw. Setbacks should be between a wind turbine and the following:

Roadways
Established snowmobile trails
Property lines of non-participating landowners
Parks and recreational areas

It should be noted that although there is the potential for ice throw, no instances of litigation were found to aid in assessing the risk level (2,3).

If commercial wind turbines are placed in the Town of Hamlin, it is recommended that, to mitigate the potential damage from ice throw, setback distances for wind turbines be established based on the calculation in Reference 1 that utilize the turbine tower height, blade length and maximum rotation speed as specified in any wind project proposal.

Example: Minimum setback of 1700 feet for a turbine with a tower height of 300 feet, blade length of 100 feet and a rotation speed of 20 RPM

References

(1) PART 1--basic kinematics, Professor Terry Matalsky, Department of Physics and Astronomy, Rutgers University (from website)

(2) Letter from 'Energy Insurance Brokers (EIB)' dated November 16, 2004, From NYSERDA website www.powernaturally.org

(3) Letter from 'South Bay Risk Management & Insurance Services' dated November 13, 2004, From NYSERDA website www.powernaturally,org

15. Flicker

Flicker is the term used to describe the moving shadows that are cast by wind turbine blades that are in motion. Flicker is also used to describe the strobe-light effect observed when direct sunlight is rapidly blocked and unblocked by wind turbine blades that are in motion. These moving shadows or strobe-light effects are considered, at a minimum, a distraction or nuisance, and can be a dangerous safety hazard. There is also mounting evidence based on medical studies that the effect of flicker may cause physiological effects in those susceptible to it.

Areas of flicker are constantly changing with the position of the sun during the day as well as during the year. For example, flicker shadows will be very long and project in a westerly direction from the turbine early in the morning, shorten in length as the sun rises in the sky, and then lengthen again in an easterly direction as the sun sets. The projections will also change position throughout the year from mostly west-east during summer months to more northerly during winter months. The orientation of the turbine blades will also impact the direction of flicker.

Flicker would not be created when the sunlight is not strong enough to cast shadows (for example, overcast sky). Also, topography, hedgerows, etc. can serve to block flicker.

Locations that would be considered adversely affected by flicker are roadways, homes and outdoor areas frequently populated (yards, cemeteries, State Park at Hamlin Beach, playgrounds, etc.).

Meridian Energy (New Zealand) states in a report: “Experience abroad has shown that shadow flicker will have no affect on properties at a distance further than 10 turbine rotor diameters from the turbine” (1). For the project referenced, a distance of 900 meters (about 2970 feet) represented 10 rotor diameters, implying a rotor diameter of 90 meters (about 297 feet, or a blade length of about 150 feet). For comparison, for the turbines installed at Maple Ridge, 10 rotor diameters would be about 2620 feet (about 1/2 mile, 2640 feet) based on a blade length of 131 feet.

A conservative approach to setting a setback distance to mitigate the impact of shadow flicker would be a simple uniform distance around a wind turbine based on rotor diameter. However, since shadow flicker projections would be shortest in areas south of wind turbines due to projected sun angles in this region, setback distances could be shorter in only that direction.

Of primary concern are roadways, where flicker would have the most significant impact as the above-mentioned distractions could adversely affect driver behavior.

No information was available on other roadways in the Town of Hamlin.

The same criteria can be applied to other potentially adversely affected areas (homes, back yards, etc.) or general areas (property lines of non-participating land owners). Less restrictive (shorter distances) criteria may also be applied to these areas with the tradeoff of allowing flicker in these areas.

If commercial wind turbines are placed in the Town of Hamlin it is recommended that a uniform setback distance of 10 rotor diameters be established between a wind turbine and major roadways (Redman Rd, Moscow Rd, Cook Rd. and County Line Rd.).

If commercial wind turbines are placed in the Town of Hamlin, it is recommended that a uniform setback distance of 10 rotor diameters be established between a wind turbine and the existing homes.

References

(1) Meridian Energy, Project West Wind Shadow flicker assessment report, Prepared by Paul Botha MSc, June 22, 2005

(2) CUBE Engineering GmbH, Flicker Effect Calculations for Wind Energy Projects, From website: www.cube-engineering.com/englisch/dienst/pdf/d_u_3.pdf

(3) WIND Engineers, Inc., Shadow-Flicker Modeling, Wild Horse, WA, PO# Chris Taylor, Nov. 2003, Date: Nov. 20, 2003

(4) Presentation: ‘Municipal Regulation of Wind Energy Facilities,’ New York State Department of State, Page 20, Slide 1

16. Stray Voltage

Stray voltage is the term used to describe a special case of voltage developed on the grounded neutral system of a farm. If this voltage reaches sufficient levels, animals coming into contact with grounded devices may receive a mild electric shock that can cause a behavioral response. Behavioral response studies have focused primarily on dairy cows (1).

The problem of stray voltage is likely not caused nor worsened by wind generators (2). Never-the-less, potential problem areas, specifically concerning all farm animals as well as wildlife, should be considered as part of any wind project proposal.

If commercial wind turbines are placed in the Town of Hamlin, it is recommended that an assessment of stray voltage conditions in potentially problematic areas be carried out prior to the installation of, and after commencement of operation of, any wind farm project. Correction of stray voltage issues attributable to the operation of the wind farm should be carried out within 7 days of verification of the problem.

References

(1) What Do We Know About Stray Voltage? Douglas J. Reinman, Ph.D., Professor of Biological Systems Engineering, University of Wisconsin - Madison, March 28, 2003; from NYSERDA website; www.powernaturally.org

(2) AWS Truewind, Transmittal to Vicki Colello, NYSERDA, Re: Wind Energy and Stray Voltage, March 7, 2006, from NYSERDA website www.powernaturally.org

17. Radio and Television Interference (Electromagnetic Interference)

Consumer

Commercial wind turbines are recognized as being a potential source of electromagnetic interference, affecting primarily conventional broadcast television. Effects on radio and cell phones are also possible. Effects on satellite television are less likely (1).

If commercial wind turbines are placed in the Town of Hamlin, it is recommended that problems affecting television reception, radio reception, cell phone operation, or other, attributable to the installation or operation of commercial wind turbines be corrected within 5 business days of recognition of the problem. Any costs associated with the correction (cable television, satellite television and radio, etc,) will be at the project owner's expense for the lifetime of the project.

Commercial

Commercial wind turbines are a recognized source of interference to microwave links. As

such, wind developers routinely consult with experts to avoid conflicts with microwave links (1).

If commercial wind turbines are placed in the Town of Hamlin it is recommended that verification of interference studies with existing microwave links (for example; cellular phone towers) be provided with any wind project proposal.

The applicant shall provide evidence in the form of test results or independent engineering studies that the wind power facilities proposed will not interfere with microwave, cellular or television/radio transmission/reception to or from existing primary structures and fixed broadcast, retransmission or reception antennas. If after construction the Owner or Operator receives a written complaint related to such interference, the Owner or Operator shall take reasonable steps, including provision of alternate communications, to respond to the complaint.

Aviation

Commercial wind turbines are a recognized source of interference to VOR (VHF Omni directional Ranging) Systems used for aircraft navigation. Existing FAA rules prevent a structure the size of a typical utility-scale wind turbine from being erected within 1 kilometer of a VOR station (1).

References

(1) AWS Truewind, Transmittal to Vicki Colello, NYSERDA, Re: Wind Energy and Electromagnetic Interference, March 6, 2006; from NYSERDA website; www.powernaturally.org

18. Removal and Restoration

Commercial wind turbines have an anticipated working lifetime of 20 years or more, and lease agreements may extend well beyond this period to allow for repowering of the project(1). After the working lifetime of the project, removal of hardware and restoration of affected land will be required. There are several aspects to removal and restoration that must be considered and are outlined as follows:

1. Cost guarantees
2. Timing
3. Scope of restoration
4. Landowner liability

1. Cost guarantees

It is expected that the cost of removal of commercial wind turbines will be comparable to the cost of installation with the need to adjust for inflation over their working lifetime. This puts a tremendous financial liability on the project with timing that is most difficult to

guarantee.

This difficulty is compounded by the possibility that the original project owner (wind turbine company) will not be the owner at the end of the working lifetime, and original agreements may not be transferred or be invalidated.

Therefore, financial guarantees to ensure that wind turbines, substations and ancillary equipment are removed, and affected land areas restored are essential. This can be done through a suitable bonding process or escrow account. A similar process is used to guarantee the restoration of quarries.

If commercial wind turbines are placed in the Town of Hamlin, it is recommended that a suitable cash bond issued by a AAA rated bonding company be put into an account to guarantee that finances are in place only for removal and restoration of the affected areas prior to commencement of any wind farm project in the Town of Hamlin.

The owner/operator shall provide the Town of Hamlin with proof of liability insurance, in the form of a duplicate insurance policy, at a level to be determined by the Town Board to cover any liability for bodily injury or property damage that might be encountered. The Town of Hamlin shall be held harmless for any and all claims resulting from this project.

2. Timing

As stated above, the anticipated working lifetime of commercial wind turbines is 20 years or more. Working lifetimes are based on expectations of profitability coupled with the expense of running and maintaining the turbines and may be shorter or longer than the 20 years expected.

Because of the variability of the length of operation for individual turbines (as well as an entire project or wind farm), a clear definition of when a wind turbine has reached the end of its working lifetime must be established, with the timeframe for subsequent removal also defined. It may be in the best interests of the wind farm operator to keep individual turbines "active" in order to minimize disruption of the entire project or delay removal of individual turbines in order to maximize efficiency by removing all the turbines in a project at the same time. In this same manner, the removal of wind turbines in the Town of Hamlin could be affected by turbines in other areas as part of the same project.

If commercial wind turbines are placed in the Town of Hamlin, it is recommended that a turbine be declared non-operational after 90 days of non-production or 90 days of production at a level less than 20% of the average production of the wind farm.

If commercial wind turbines are placed in the Town of Hamlin, it is recommended that removal of non-operational turbines be completed within a period of 6 months after being declared non-operational.

If commercial wind turbines are placed in the Town of Hamlin, it is recommended that

financial penalties be imposed on the turbine owners after the 6-month interval for removal.

If the bonding, escrow or other funding sources available for the deconstruction and removal of the towers and restoration of the area in question is insufficient then the landowner will be required to remove the towers by any acceptable means in a timely manner with a maximum of 6 months.

3. Scope

The scope of the restoration must encompass the following:

Removal of wind turbines and associated ancillary equipment
Removal of buried cable if less than 4 feet in depth (2)
Restoration of roadways used during removal

The following to be done to them satisfaction of the landowner:

Removal of substation(s) and associated ancillary equipment
Removal of concrete base of wind turbine to a depth of not less than 6 feet and restoration of affected land (2)
Removal of access roads and restoration of affected land

Special considerations: Restoration of the land on the turbine site and the access roads would require additional resources, most notably topsoil, as these would have been removed from the sites or blended into the site during installation.

4. Landowner liability

In the event that the funding to remove the commercial wind turbines and associated equipment is not adequate or unavailable at the time removal is required, the responsibility of removal of the turbines and associated equipment should fall upon the landowner on whose land the equipment was placed. This requirement should be part of the zoning requirements.

References
(1) WIND PROJECT LIFECYCLE: Overview; from NYSERDA website; www.powernaturally.org

19. Independent Oversight & Coordination

Previous chapters have discussed the need for several different aspects of independent sourcing or verification of information related to wind turbine installation, operation and maintenance, and coordination of efforts between the wind energy company and various agencies. Also, the identification of appropriate enforcement agencies and methods of enforcement should be clearly defined prior to the initiation of any wind farm project.

These activities are summarized in the table below.

Activity
Pre-Installation Engineering Evaluation
Installation
Post-Installation Inspections
Pre-Installation Site Selection and Access Roads
Television/Radio Complaints
Identification of Enforcement Agencies
Coordination with Enforcement Agencies

If commercial wind turbines are placed in the Town of Hamlin, it is recommended that a salaried position (or positions) be created to oversee and consolidate the many aspects of the project that require external resources. Compensation for the position should be provided by the wind energy company performing the installation and should be guaranteed in the event of transfer of ownership of the project or abandonment of the project. The duration of the position should be through the design and construction phases, for 1 year thereafter and as deemed required by the Town for the lifetime of the project.. Additionally, all costs for use of consultancy agencies, etc, should be compensated for by the wind energy company.

20. Safety:

All power generation units will be equipped an automatic fire suppression system and alarmed appropriately.

All power generation units shall be equipped with adequate rigging to safely lower an unconscious or injured person to ground level within 10 minutes.

The owner/operator will provide local emergency response agencies with training, practice drills and documentation of appropriate actions in case of emergency circumstances at the project site. Such documentation shall include the location of all emergency shutdown controls, location and identity of any potentially hazardous materials, and site maps showing access routes.

Wind tower(s) shall be equipped with sensors to detect ice or snow build-up and appropriate actions will be taken to prevent ice throw.

All towers must be protected by anti-climbing devices such as sealed entrances for internal stairs with locking portals.

All wind energy systems shall be equipped with automatic braking, governing and feathering system to prevent uncontrolled rotation. Maximum speed of rotors shall be 20 rpm.

21. Environmental:

A complete environmental study must be done including migratory bird flight patterns, bird and bat studies, impact of alterations to native wildlife habitat, effects on ground water and storm water run-off, and any and all environmental concerns as stipulated by the Town of Hamlin and the NYS Dept. of Environmental Conservation.

All bird and bat studies shall be conducted by The U.S. Dept. of Fish and Wildlife, their designee or an independent agency to the specification of The U.S. Dept. of Fish and Wildlife.

All possible precautions will be taken to minimize hazards to birds, bats, wildlife, people and the environment .

We recommend a Type I positive declaration SEQR with a full environmental assessment form and all studies and expenses to be paid by the developer. We also recommend that the Town of Hamlin be designated the Lead Agency.

All environmental issues and concerns will be addressed in a Full Environmental Impact Statement which will address the concerns of the residents of the Town of Hamlin, The NYS Dept. of Environmental Conservation, The NYS Dept of Transportation, The Town of Hamlin Highway Dept., The Town of Hamlin Conservation Board, The Town of Hamlin Town Board, The Town of Hamlin Planning Board, The Monroe County Dept of Planning, and any and all other concerned parties.

All solid and liquid wastes related to construction, operation and maintenance of the project will be removed from the site and disposed of in accordance with applicable laws.

22. Enforcement

Upon receiving a complaint or report of defective equipment, authorized personnel will verify the problem and immediately notify appropriate representatives of the wind tower company.

Any failure to repair problems, address issues or shut down defective equipment will result in a fine as set by the Town of Hamlin until repairs are made or equipment is shut down. We recommend a fine of $2500.00 per day.

In the event of an emergency, authorized local personnel will shut down equipment to protect the public and the defective equipment.

Any wind tower that is not repaired within 180 days will be removed in its entirety.

Failure to properly maintain or repair equipment/wind tower will result in non-renewal or

revocation of Special Use Permit. We strongly recommend a SUP for each tower renewable annually upon proof of proper maintenance and any necessary repairs as needed.

An authorized representative will be available at all times to respond within 30 minutes for any and all problems, concerns or emergencies.

23. Other

The information presented in this document is by no means a complete assessment of all the factors that should be evaluated before decisions are made regarding commercial wind turbines. Further information can be found at the NYSERDA web site:

www.powernaturally.org

24. Acknowledgements

The committee would like to thank the following individuals for taking the time to personally address the committee and answer questions:

Dr. Matthew McDonald
Kathy Habgood
David Martin
Melanie Fahmer
Tom Ingraham

The committee would also like to thank the citizens of the Town of Hamlin who participated in this study by submitting questions or by attending committee meetings.

25. Definitions

Industrial Wind Tower:

Also referred to as Industrial Wind Turbine, Industrial WECS or Industrial Wind Energy Conversion System. A structure that converts the kinetic energy of the wind into 24all parts of the system, including the tower and the transmission equipment.

Residential/Commercial Windmill:

Also referred to as Residential/Commercial WECS or Residential/Commercial Wind Energy Conversion System. Any privately owned and operated structure to convert the kinetic energy of the wind into a useable form of electrical or mechanical energy for an individual home or business. System must conform to Town of Hamlin Zoning Code 125-45.