

Jerusalem Preservation Association **Suggested Changes to Town of Jerusalem's Proposed Wind Farm Law** Page 1 of 4 11/9/10 **Key Standards**

| <b>Standard</b>                      | <b>Best Practices (B.P.)</b>   | <b>Jerusalem's Law</b>   | <b>Precedents</b>  | <b>Comments</b>  |
|--------------------------------------|--|--------------------------|--|--|
| <b>Noise</b> <sup>(1)</sup>          | <6 dBA over background @ prop lines<br><5 dBC over background @ prop lines | 45 dB at 1,000 ft        | Hrtsvll: see B.P.<br>S. Brstl: no wind<br>Bovina: no wind<br>Malone: no wind | The existing background, nighttime sound level in most rural areas is about 25 dB (A). NYS Department of Environmental Conservation issued a guide on assessing noise impacts that states, "increased sound levels of 6 decibels will cause community complaints, and an increase of 20 decibels is intolerable." Operating wind farms have been measured causing sustained sound levels in excess of 70 dB (A) well over 1,000 feet away. |
| <b>Setbacks</b> <sup>(2)</sup>       | 2,640 feet   | 1.25 X Hgt (nom. 550 ft) | Hartsville: ½ mi<br>Gorham: 2,000 ft<br>S. Brstl: no wind<br>Malone: no wind | Harm from noise, visual impact, threat from ice throw, shadow flicker is in direct proportion to the magnitude of turbine height. Proper set-back regulation can be used to mitigate wind turbine problems.  |
| <b>Shadow Flicker</b> <sup>(3)</sup> | Not tolerated at or near residences  | < 25 hr/yr w/o waiver    | Hartsville: see "Comments"<br>Grhm: <5 min/dy<br>S. Brstl: no wind           | ". . . shadows from wind turbine blades shall not fall upon the windows of nearby dwellings or within 100 feet of dwellings for any considerable period." – Hrtsvll WF Law   |
| <b>Height</b>                        | 350 feet max.  | 500 feet max             | Gorham: 300 ft<br>S. Brstl: no wind<br>Malone: no wind                       | Proper height regulation can be used to mitigate wind turbine problems. Harms from noise, visual impact, threat from ice throw and shadow flicker are in direct proportion to the magnitude of turbine height.   |
| <b>Property Value Guaranty</b>       | PVG Bond Escrow  | None Presently           | See AGO Appraisal, McCann, etc.  | Language that requires any Wind Development company to protect values located within 2 miles of any turbine with a PVG Bond to be held in escrow.  |

**References and Annotations from Town of Harstville; Local Law No. 2 of 2009, Wind Energy Facilities**

(1) Noise:

p2, vii. Wind turbines may be significant sources of noise, which, if unregulated, can negatively impact adjoining properties.

p2, x. Wind turbines may be significant sources of noise, which, if it is not properly and adequately regulated, can negatively impact human health.

p2, xi. The New York State Department of Environmental Conservation recommends that noise increases in non-industrial areas like Hartsville be limited to 6 dBA over background. See NYSDEC (2001), pg. 14.

p2, xii. Background sound levels in rural residential areas in New York are commonly in the range of 20 dBA to 30 dBA at night. (See Kamperman and James 2008; Acoustic Ecology Institute Special Report: Wind Energy Noise Impacts 2008).

p2, xiii. Minimum setbacks from dwellings are necessary to mitigate noise impacts. Pre-construction sound models in the past have failed to accurately predict wind turbine noise impacts. This is apparent in the experience with wind farms in Cohocton, Steuben County, New York. This may be due to factors such as atmospheric conditions, temperature inversions, wind layers, geography and low frequency noise which travels further with greater intensity than higher frequency noise. In addition, at night when air stabilizes near ground level, elevated wind turbine noise can travel further than expected and can be 5-15 dB(A) louder than predicted with conventional models. (See Kamperman and James 2008).

p3, xiv. A C-weighted sound determination (dBC) is needed to minimize adverse health effects from low frequency noise. A dBC requirement will likely result in setbacks between large wind turbines and nearby dwellings of 1 km, (0.62 miles) or greater for 1.5 to 3 MW wind turbines if wind turbines are located in rural areas where L90A background levels are close to 30 dBA. (See Kamperman & James; WHO 1999; Bajdek Noise-Con 2007; Pedersen and Wayne, 2008).

p3, xv. Noise diminishes with distance. According to a sound propagation formula in Wind Turbine Acoustic Noise White Paper by the University of Massachusetts Renewable Energy Research Lab, a sound power level (SPL) of 35 dBA is reached at approximately 1/2 mile from a wind turbine based on a sound power of 102 dBA at hub height for 1.5 to 3 MW wind turbines. Therefore, at a distance of less than 1/2 mile, a wind turbine will create a SPL that exceeds safe levels. (See Rogers 2006, pg. 18, Figure 11; Burton 2001).

p3. xvi. While mechanical sounds of wind turbines have been reduced by modern designs, aerodynamic sounds by air turbulence around the turbine blades have increased with increasing turbine size. Therefore, this local law requires siting based not only on set-backs, but also on numerical noise limits.

p3. xvii. The closer people live to wind turbines the more likely they will experience noise annoyance or develop adverse health effects from wind turbine noise. This has been demonstrated by the on-going problems reported by residents in the nearby Town of Cohocton in which industrial wind energy facilities have become operational over the past year. This has also been demonstrated by continuing reports of problems related to noise at other recent wind energy projects throughout the United States. Further, the degree of difficulties resulting from the sound of wind turbines seems clearly related to the distance from the turbines, though the literature has studied a variety of turbine sizes in a variety of locations. A setback of 2,460 feet from dwellings would eliminate most noise complaints. Research conducted by Bajdek (2007) showed that at approximately 0.8 km (1/2 mile) from wind turbines, 44% of the population would be highly annoyed by wind turbine noise. At a distance of approximately 1.62 km (1 mile) from wind turbines, the percent of highly annoyed people is expected to drop to 4%. Kamperman and James reviewed several studies to determine the impact of wind turbine noise on nearby residents. Their review showed that some residents living as far as two miles from wind turbines complained of sleep disturbance from turbine noise and many residents living 1,000 feet from wind turbines experienced major sleep disruption and other health problems from nighttime turbine noise. Van den Berg (2006) studied a wind farm in northwestern Germany and discovered that residents living 500 meters (1,640 feet) from the wind turbines reacted strongly to wind turbine noise and residents up to 1,900 meters (1.18 miles) from the wind turbines expressed annoyance. A survey conducted by Pedersen and Waye (2008) found that less than 10% of the respondents experienced sleep disturbance at distances of 1,984 feet to 3,325 feet and found that the sound from wind turbines was of greater concern in rural environments because of the lower ambient noise. The Town of Hartsville notes with approval that wind project developer E.On Renewables (2007) has stated on its website that the minimum distance between a wind turbine location and the nearest dwelling should be at least 750 meters (2,461 feet).

p4. xviii. Several studies recommend wind turbines be located between 1/2 mile to over 1 mile from dwellings. To avoid adverse noise impacts, the Western Australia Planning Commission Bulletin recommends that wind energy systems include sufficient buffers or setbacks to dwellings of 1 km (0.62 mile). The National Wind Collaborating Committee states that an appropriate setback distance may be up to 1/2 mile. The National Research Council states noise produced by wind turbines generally is not a major concern for humans beyond one mile or so because various measures to reduce noise have been implemented in the design of modern turbines. The Wisconsin towns of Woodville, Clay Banks, Magnolia, Wilton and Ridgeville recently adopted large wind turbine ordinances with setbacks of 1/2 mile from dwellings. The French National Academy of Medicine and the UK Noise Association suggest a 1.5 km (approximately 1 mile) distance between large wind turbines and dwellings. See

Gueniot (2006). Dr. Amanda Harry (2007), Dr. Nina Pierpont (2006), and Frey and Hadden (2007) recommend a setback greater than 1 mile.

p20 §13a. Sound Levels and WTG Setbacks;

Sound Levels. The statistical L- sound level generated by a WTG shall not exceed 6 dBA above the A-weighted background sound levels measured at the nearest non-participating property boundary, and the statistical L sound level generated by a WTG shall not exceed 5 dBC above the C-weighted background sound levels measured at the nearest sensitive receptor located off the Site, measured from the property boundary of the receptor.

(2) Setbacks

p20 §13b Setbacks.

Each WTG shall be located with the following minimum setbacks, as measured from the center of the WTG:

- i. 2,460 feet from off-Site Residences, measured from the exterior of such Residence.
- ii. At least 1,000 feet from the nearest Nonparticipating property owner's property line.
- iii. 100 feet from state-identified wetlands, except where permits for other setbacks have been received from the New York State Department of Environmental Conservation, or from the federal Environmental Protection Agency.

(3) Shadow Flicker

p4, xix, Adverse health effects from wind turbine noise can be exacerbated by the rotating blades and shadows from the wind turbines. As wind turbine blades rotate in front of a rising or setting sun, they cast a strobe-like flicker that cannot be avoided by occupants. Shadow flicker can cause some people to become dizzy, nauseated or lose their balance when they see the movement of the shadow. Shadow flicker from wind turbines at greater than 3 Hz poses a potential risk of inducing photosensitive seizures. Therefore, wind turbines should be sited such that shadows from wind turbine blades do not fall upon the windows of nearby dwellings or within 100 feet of dwellings for any considerable period. The National Wind Coordinating Committee (1998) recommends a setback of 10 rotor diameters to avoid shadow flicker on occupied structures. See also Cummings (2008); Burton et al. (2001); UK Noise Association (2006); Harding (2008); and Pierpont (2006a and 2006b).

p4, xx, If placed too close to a road, the movement of the wind turbine blades and resulting shadow flicker can distract drivers and lead to accidents. See National Research Council (2007), pg. 161.