

Otsego County Planning Commission White Paper

Land Use Issues of Wind Turbine Generator Sites

Ice Throw

Ice throw is a concern related to the fact that any object at the end of the rotating blades is traveling at a high rate of speed. In the case of a 60 meter turbine (about 200' diameter), rotating at 20 RPM, the tip of the blade is traveling at just over 140 mph. If the turbine diameter increases to 80 meters, the tip speed increases to just over 187 mph. There are reports of ice having accumulated at the tip of the turbine and upon breaking loose, traveling significant distance. While there are theoretical claims that ice can travel great distances when sent flying from an operating turbine, most use the simplifying assumption that there is no air resistance. This assumption leads to very significant errors. Recent studies involved computer modeling which includes the influence of air resistance on ice throw.¹ These studies included validation of the computer model by comparison with field observations. While their recommendation is to use the complex computer models to evaluate each site, there are some general conclusions. A general rule of thumb is to require safety setbacks of $D = 1.5 \times (HH + RD)$, where D is the setback distance, HH is the hub height of the turbine and RD is the rotor diameter of the turbine. Furthermore, when ice is released from an operating wind turbine, the force of the air against the ice tends to break it into smaller fragments. Ice and snow falling from a stationary turbine tends to fall in larger pieces, particularly those that fall from the nacelle.

Some in the industry respond that there is no ice throw problem, this is just another urban legend. Their reasoning for this is that ice accumulation on the blades spoils their aerodynamic shape and the blades naturally come to a standstill.

Ice shedding is when ice accumulated during freezing rain starts to thaw, break loose and fall to the ground. Ice shedding is a problem common to all tall structures such as radio towers, bridges, power lines and the like. The Mackinaw Bridge is sometimes closed to traffic during those time thick ice deposits are breaking loose and falling to the bridge deck. For anyone to assert that wind turbines will not collect and then shed ice does not seem any more reasonable than the theoretical prediction that ice will fly thousands of feet.

Addressing The Issue

The Otsego County Zoning Ordinance currently deals with this problem on cellular towers by requiring a setback distance that is 1 ½ times the height of the tower. The research on wind turbine ice shedding in Europe has resulted in a similar recommendation. A safety setback distance from any area road, building, or area open to the public seems prudent.

Using $D = 1.5 (HH+RD)$ For a Vestas V66 Turbine with a Hub Height of 78 meters and Rotor Diameter of 66 meters this would require a safety setback of 216 meters or 708 feet. It is interesting to note that this is not normally a problem in most of Europe where noise restrictions result in residential setbacks of 300-400 meters.

¹ Risk Analysis of Ice Throw From Wind Turbines by Henry Seifert et al, DEWI (German Wind Energy Institute)

² Technical Requirements For Rotor Blades Operating In Cold Climate by Henry Seifert, DEWI (German Wind Energy Institute)

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