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ST. LAWRENCE WIND ENERGY PROJECT SUPPLEMENTAL SHADOW FLICKER ANALYSIS

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Shadow Flicker Analysis

Wind turbines can cause a flickering effect when the rotating turbine blades cast shadows that move rapidly across the ground and nearby structures. This can cause a disturbance within structures when the repeating pattern of light and shadow falls across the windows of buildings; particularly when occupants are trying to read or watch television. The effect, known as shadow flicker, is most conspicuous when windows face a rotating wind turbine and when the sun is low in the sky (e.g., shortly after sunrise or shortly before sunset).

While the study of shadow flicker is a relatively new discipline, evidence from operational turbines suggests that the intensity of shadow flicker is only an issue at short distances. It is generally accepted that shadow flicker will have no affect on properties at a distance further than ten (10) turbine rotor diameters from the turbine (approximately 3,000 feet for this Project).

Shadow flicker will only occur when certain conditions coincide:

- Daylight hours (sunrise to sunset) – shadow flicker does not occur at night;
- Sunshine – flicker will not occur on overcast days when daylight is not sufficiently bright to cast shadows;
- Receptor is within ten (10) rotor diameters of the turbine – beyond this distance a person should not perceive a wind turbine to be chopping through sunlight, but rather as an object with the sun behind it.[1]
- Windows face the turbine – turbine shadows can only enter a structure through unshaded windows; and
- Turbine is rotating – no flicker will occur when the turbine is shut down.

Because of constantly changing solar aspect and azimuth, shadows will be cast on specific days of the year and will pass a stationary receptor relatively quickly. Flicker will not be an everyday event or be of extended duration when it does occur. For receptors located to the west of a turbine, a residence is more likely to fall within the shadow zone shortly after sunrise when affected residents are typically asleep with shades drawn. For receptors located to the east of a turbine, a residence is more likely to fall within the shadow zone shortly before sunset.

When the rotor plane is in-line with the sun and receptor (as seen from the receptor), the cast shadows will be very narrow, of low intensity, and will move quickly past the stationary receptor. When the rotor plane is perpendicular to the sun-receptor "view line," the cast shadow of the blades will move within a larger elliptical area.

The distance between a wind turbine and a receptor affects the intensity of the shadows cast by the blades, and therefore the intensity of flickering. Shadows cast close to a turbine will be more intense, distinct and "focused." This is because a greater proportion of the sun's disc is intermittently blocked. Similarly, flickering is more intense if created by the area of a blade closer to the root and further from the tip. Beyond ten (10) turbine diameters (approximately 3,000 feet for this Project) the intensity of the blade shadow is minimal.

[1] http://www.dti.gov.uk/energy/sources/renewables/planning/onshore-wind/shadow-flicker/page18736.html