

# WINDLETTER

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## SMALL TURBINE COLUMN:

### **Residential Wind Turbine Tower Height and Zoning Hearings**

**--Mick Sagrillo, Sagrillo Power & Light**

One problem that applicants for residential wind turbines often come up against when they approach their local zoning authority for a building permit is that the zoning ordinance in place does not have a section specifically regulating wind turbines and towers. For this reason, the zoning committee will opt to govern the request under any number of other sections of the ordinance. This is particularly the case when it comes to tower height. Wind generator towers are sometimes treated like any other structure on a homeowner's property, and, unfortunately, often severely restricted in height.

In most areas of the country, people have trees, as well as buildings, in their yards. When determining how tall a tower to install for the wind system, these obstacles must be taken into consideration. The rule of thumb that is used for determining the tower height for a residential wind system is that the wind turbine rotor (the rotating blades and hub) must be at least 30 feet above anything within 500 feet of the tower, or the local tree line, whichever is higher. There are three reasons for this: ground drag, turbulence, and potential tree growth.

The wind turbine's rotor is the collector for the system, "gathering" wind which turns the generator to generate electricity. This collector only works if there is wind passing through it. As you move away from the surface of the earth, wind speed increases. This is due to the fact that the earth and its obstacles create a zone of friction on the moving air masses. This phenomenon is known as "ground drag," and it rapidly decreases with height above the local terrain, buildings, and trees.

Since any clutter on the ground, including buildings and trees, will obstruct the movement of the wind past the rotor, the rotor must be placed in the free flow of air above the zone of friction caused by the obstacles. Installing a short tower with the rotor at or below the tree line is akin to putting a hydroelectric generating plant on the bank of a river instead of in the river itself. Sure, the hydro plant might generate some electricity during a flood. But for the rest of the time, the plant is high and dry, and not generating anything.

In addition, ground clutter in the form of trees and buildings will create turbulent airflow around and above these obstacles, and this turbulence will pass through the rotor as well. Turbulence is very destructive to wind turbines, causing excessive wear and tear, which results in more maintenance and a shorter life. In addition, while there is air motion, there is little "wind power" in turbulence that is convertible to electricity.

Finally, today's tree line may grow in the expected 20- or 30-year life of many residential wind systems. Therefore, mature tree height is used to determine tower height along with the "30-foot rule."

As a result, most residential wind turbine towers are in the 80- to 120-foot range, with some considerably taller than this.

While most would-be wind turbine owners understand these concepts, their local zoning committee may not. Zoning officials do know, however, what their building and zoning codes state concerning permissible heights of structures. This is where their education must begin.

I am surprised by the number of building codes that restrict residential structure heights to 35 feet that "have been on the books forever." I am even more surprised to find that most people have no idea why such codes exist. Many of these building codes are based on ordinances that are literally generations old. They arose in response to factory owner abuses of their workers during the labor unrest years of the late 1800's and early 1900's. Some of the many problems encountered back then included numerous occupants stuffed into shoddy tinderbox housing, electrical (and plumbing) disasters waiting to happen, and the very real threat of fire under these circumstances. This situation gave rise to the fire, electrical, and plumbing codes that were the precursors of today's building and zoning codes.

The 35-foot height restriction was one of the codes that came out of that period. Since the fire fighting technology of the time could only pump water about 32 feet high, buildings were limited to a total height of 35 feet. This number was grandfathered into many building ordinances, and still exists today around the U.S.

Exceptions have often been made to this height restriction over the years, especially for structures that one cannot live in. For example, it would be an economic hardship to limit silo height on a farm, as it would mean building a number of short silos instead of one tall one. In addition, radio and television transmission towers and cell phone towers are granted exceptions, as they cannot effectively transmit over long distances if they are at or below the tree line on the local landscape.

Likewise, residential wind turbine towers should be excepted from any height restrictions, as they become essentially ineffectual at or below the tree line, and turbulence and ground drag substantially compromise the installation just above the tree line. Once zoning committees understand the reasons behind tall towers for residential wind systems, most will entertain height exemptions for these structures as well.

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[Editor's Note: The opinions expressed in this column belong solely to the author.]