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DWEA Briefing Paper: Tower Height

The Biggest Barrier

Tower height limitations are the single biggest regulatory barrier to the use of small wind systems in the United States. Small turbines need to be on towers 60 – 180 ft tall to be effective, depending on the height of nearby trees and other obstructions, but antiquated zoning ordinances typically limit the tower to unworkably low heights, such as 35 ft. Putting a small wind turbine on a short tower is like putting a solar system in the shade.

It's the Physics

The wind close to the ground and around trees and buildings is choppy (turbulent) and weak because surfaces and obstacles interfere with smooth wind flow. You experience these effects when you duck behind a building to get out of the wind or experience turbulence on an airline flight. Wind blockage and turbulence radically reduce performance and they significantly increase the wear and tear on the wind turbine structure. And contrary to the claims of some wind industry hucksters, there are no wind turbine technologies that can overcome the harmful effects of turbulence and the poor energy production from short towers. Hype changes, but physics does not. As industry experts put it "Short towers shortchange customers".

Tall Towers are a Must

After 35 years of experience and tens of thousands of installations, the industry guidance on minimum tower height, to the lowest extension of the rotor, is 60 ft., assuming no obstacles, or at least 30 ft above any obstacles within 500 ft. So if the mature height of trees in the area is 75 ft and the turbine rotor diameter is 20 ft then the minimum recommended tower height is 75 ft + 30 ft + 10 ft = 115 ft. As an example, a 5 kW residential wind turbine on a 35 ft tower in an open area might produce 1,200 kWh annually in a moderate wind regime, but the same turbine on a 115 ft tower would generate 9,000 kWh per year. In other words, it would take eight turbines at 35 ft to equal the output of one more properly sited at 115 ft. This because the power in the wind increases exponentially with wind speed, so small differences in wind speed produce big changes in turbine output.

Why Not Tall Towers?

The common 35 ft height restrictions seen in many zoning ordinances were introduced over a century ago as a fire safety measure because that was how high the manual fire pumps of the day could pump water. Unfortunately for potential small wind customers these height limits were not adjusted as fire engine technology improved. Applying the 35 ft restriction to small wind is highly discriminatory for a number of reasons. First, almost all zoning jurisdictions have utility structures (power poles) that exceed 100 ft. Second, the FAA has no restrictions on towers below 200 ft unless you are near an airport. Third, towers designed to the latest edition of the International Building Code (IBC) are stronger than nearby homes and buildings and there has never been an injury related to the failure of an operating small wind turbine. Finally, there will never be a tall man-made structure that does not generate some aesthetics criticism, as was the case with the Eiffel Tower, the Brooklyn Bridge, and the Statue of Liberty. However, the minority NIMBY (Not In My Back Yard) complaints should be kept in perspective and balanced against the overwhelming societal good of wind energy. **DWEA recommends that for property sizes of one acre or more there be no height restrictions on certified wind turbines installed on towers meeting the IBC design code.**