

# Wind Turbine Optimization

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Wind turbines are one of the most important sources of renewable energy in the world. As of the end of 2016, 340000 units were installed worldwide, totaling half a terawatt of generating capacity<sup>1</sup>. A typical large turbine is capable of producing 2 megawatts, with a rotor diameter of 90 meters, and each of its three composite blades weighs 7 tons. Price is critical, as is performance. Blade shape must be optimized so that the turbine produces the most useful power over its entire service life, subject to expected wind conditions in situ; but also, it must be structurally optimized to survive a complex set of loadings, while using the least resources and time possible in its manufacture. For these reasons, wind turbine aerodynamic and structural analysis has received much attention. The purpose of this talk will be twofold: to give an overall view of the state of the art in turbine optimization, and to illustrate the role of curves and surfaces in blade modeling.

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<sup>1</sup><http://gwec.net/global-figures/wind-in-numbers/>