The Physics of Wind Power

The equations that represent the physics of wind power are very similar to the ones that are presented for water power. Follow the link to water power physics for more information.

Before the wind blows, the blades have potential energy because they have a height above sea level. For more examples of potential and kinetic energy see the help page. The wind moves at a certain velocity that the blades move on. The wind particles thus have a definite kinetic energy. The formulas for kinetic energy and potential energy are defined below, where m is the mass in kilograms, g is the gravitational constant (-9.8 m / s^2), h is the height, and v is the velocity:

$$PE = m * g * h$$

$$KE = 0.5 * m * v^2$$

The formula for determining the amount of power that is generated is found by dividing the total energy by the time that the wind power system was in operation. This equation is summarized below:

$$P = E / t$$

After the potential energy of the blades is converted to kinetic energy by a transfer of kinetic energy from the wind to the blades, the energy is converted to mechanical energy. The blades push the turbine. Whenever work is done on something, mechanical energy is present. The kinetic energy of the blades is turned into mechanical energy. The last step in the process is done by the generator where the mechanical energy is converted to electrical energy. Some problems are available for practice with the equations presented here. Also please take a quiz to see if you understand this content.