How to calculate wind energy

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Wind Energy and Power Calculations

The Wind Energy and Wind Power Calculator allows you to estimate the kinetic energy of wind and the corresponding wind power. By considering the surface area, wind speed, duration, and air density, you can calculate the energy and power associated with the wind.

Wind energy represents the kinetic energy of air in motion, considering its density and velocity. To estimate wind energy, the calculator employs the formula:

where:E is the wind energy,A is the surface area perpendicular to the wind direction,t is the duration of the wind,r is the density of air, andv is the wind speed.

Additionally, wind power is the energy per unit time, so the wind power formula is:

However, it"s important to note that wind energy, as calculated, represents the kinetic energy of the wind and needs to be converted into another form of energy, such as electrical energy. Albert Betz"s research showed that the maximum amount of kinetic energy that can be captured from the wind is around 59.3%.

To give you an idea about wind energy and power, below are some fun facts for reference.

Energy:The heat required to raise the temperature of 1 liter of water from 20?C to 100?C is 335 000 Joules1 kW?h is 3 600 000 JoulesEnergy of explosion of 1 tonn of TNT is 4 184 000 000 Joules

Typical power of electric kettle ranges from 800 to 2500 WattEurostar train has a power of 12 000 000 Watt.

The power in the wind is given by the following equation:

The following are calculations for power available in the wind at three different velocities for the Northwind 100Cturbine. This is the newerversion of the Northwind 100Aon the previous page. The calculations will show what happens when you double, then triple the velocity. Take a moment to think about how much available power will increase if you double and triple the velocity:

The output of a wind turbine is dependent upon the velocity of the wind that is hitting it. But as you will see, the power is not proportional to the wind velocity.Every turbine is different. In order to determine the output of a specific turbine at a given wind velocity, you need its power curve. The power curve and corresponding datafor the Northwind 100C can be seen below:

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