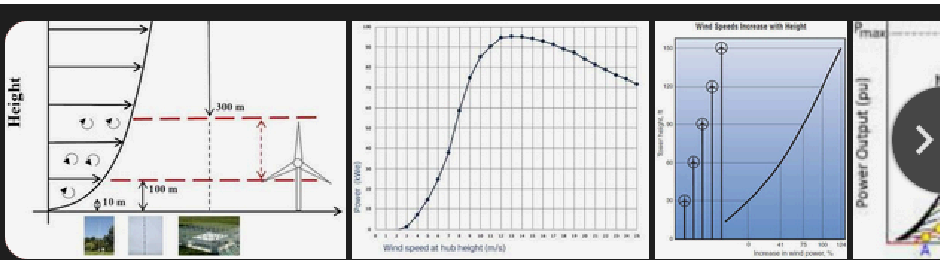
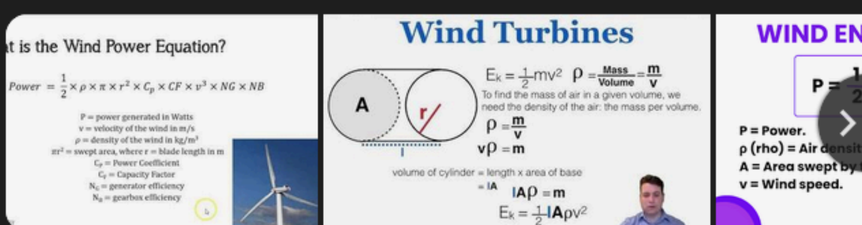



To calculate wind power capacity at different altitudes, use the formula P = 0.5 * ρ * A * v³, where ρ is air density, A is the swept area, and v is the wind speed cubed. You must also consider the effect of altitude on air density (density decreases with altitude), and use site-specific data or a wind atlas, such as the [Global Wind Atlas](), to accurately model wind speed variations.

### 1. Basic Wind Power Formula

- **P = 0.5 * ρ * A * v³**:
  - **P**: Power in the wind (Watts).
  - **ρ (rho)**: Air density (kg/m³). This is the most important variable that changes with altitude.
  - **A**: Swept area by the turbine rotor (m²).
  - **v**: Wind speed (m/s).




The fundamental formula to calculate the power (P) available in the wind is P = 0.5 * ρ * A * v³, where ρ (rho) is the air density, A is the swept area of the turbine blades, and v is the wind speed. For the power captured by a wind turbine, the formula becomes P = 0.5 * Cp * ρ * A * v³, including Cp, the power coefficient, which represents the turbine's efficiency.

Understanding the Formula Components

AI Overview

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To convert Global Horizontal Irradiance (GHI) to wattage for a solar panel, use the formula: Wattage = (Panel Area x GHI) x (Panel Efficiency). You must first obtain the GHI in Watts per square meter ($W/m^2$) for your location, then multiply it by the total surface area of your solar panels. Finally, multiply that product by the panel's efficiency (a decimal value) to get the expected wattage output at that moment.

**Here's a step-by-step breakdown:**

**1. Find the GHI for your location:**

This value represents the total solar radiation hitting a horizontal surface in Watts per square meter ($W/m^2$), according to Seven Sensor. You can find this data from online sources like the Global Solar Atlas or HOMER Energy.

**2. Determine your panel's area:**

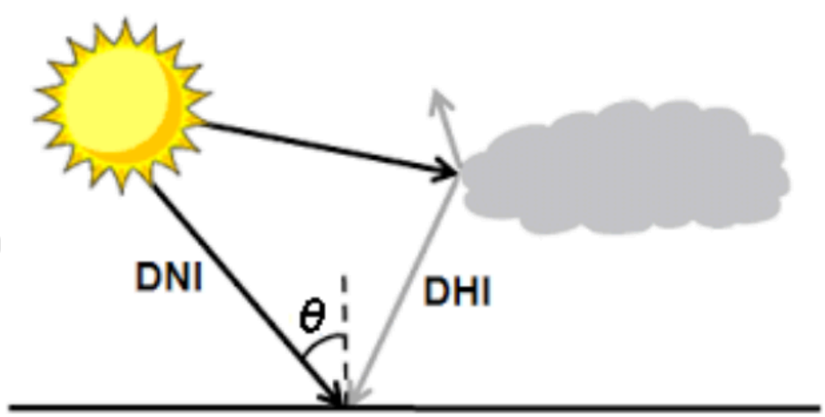
Calculate the total surface area of your solar panels in square meters ($m^2$).

**3. Multiply GHI by Area:**

This step calculates the total amount of solar power hitting your panels' surface.

- Example: If GHI is 800 $W/m^2$ and your panels have a total area of 2 $m^2$, then 800 $W/m^2$ x 2 $m^2$ = 1600 Watts.






$$GHI = DNI \times \cos(\theta) + DHI$$

Equation of calculating GHI using DNI and DHI.