

APPLICATION OF THE WIND PROFILE POWER LAW IN THE WIND ENERGY INDUSTRY

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The wind profile power law is a mathematical relation that describes the variation of wind speed with height above the ground. It is expressed by the formula

$$\frac{v_2}{v_1} = \left(\frac{z_2}{z_1} \right)^\alpha, \quad (1)$$

where v_1 is the wind speed at the reference height z_1 , v_2 is the wind speed at height z_2 , and α is a parameter called the wind shear exponent. Parameter α depends on the measurement location and time. A common value of this parameter is 0.143.

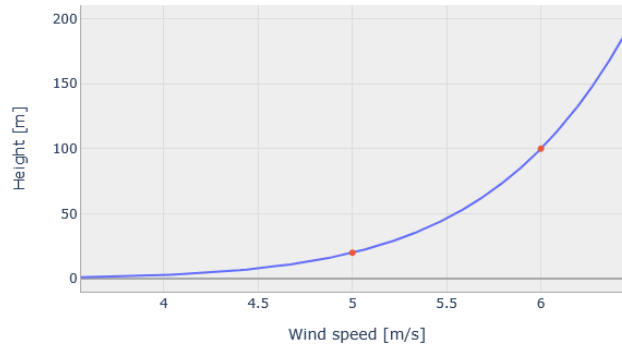


Fig. 1. Graph of the wind profile

This formula is widely used in the wind energy industry to estimate wind speed at a height other than the measured one. It is applied in various steps of data processing. Examples of problems where it can be applied are: anomaly detection, gap filling, and vertical extrapolation.

The poster shows an overview of the application of this relation. It also presents the experiment with a couple of approaches to fill data gaps using this formula. Data from more than 100 measurement locations has been used to generate the results.

References

- [1] C.A. Lopez-Villalobos, O. Martínez-Alvarado, O. Rodríguez-Hernandez, R. Romero-Centeno, Analysis of the influence of the wind speed profile on wind power production, Energy Reports. 2008, 8, 8079-8092.