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Regulars



Blowin' in the wind: solution

In [last issue's Outer space](#) we developed a formula for the power output per unit time of a windmill:

$$P \approx 0.38 \times (U/10ms^{-1})^3 \text{ kilowatts,}$$

where U is the speed of the approaching wind. We deduced that an average wind speed of $10ms^{-1}$ gives a power output approximately equal to 0.38. The question was why this calculation significantly underestimates the true output.

The answer lies in understanding that the average speed is not a good guide. If, for example, the wind speed was $20ms^{-1}$ for half of the time unit and 0 for the other half, then we would get an output approximately equal to

$$\frac{1}{2}(0.38 \times 2^3) = 4 \times 0.38.$$

This is four times more than what we got in the original calculation.

[Back to Outer space](#)



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