Wind Turbine Noise Level at a Distance

Sound level at a dwelling from wind turbines of known sound power by hemispherical spreading with air absorption, for several turbines and with background noise.

Method: Hemispherical spreading with air absorption

Input parameters

Unit system: SI

Parameter	Value	Unit
Sound power level of one turbine	105.00	
Distance from the hub to the receiver	500.00	m
Air absorption coefficient (dB per m; about 0.005 for A-weighted broadband)	0.005000	
Number of turbines at about this distance	3.0000	
Background sound level (0 to ignore)	35.000	

Calculated results

Parameter	Value	Unit
Level from one turbine (dB)	40.539	
Level from all n turbines (dB)	45.310	
Turbines plus background (dB)	45.697	
Increase over background (dB)	10.697	

Notes for this case

• L_p = L_W − 10 $\log_{10}(2\pi R^2)$ − αR for hemispherical spreading over reflecting ground; levels add on an energy basis. A screening estimate: ground effects, barriers, wind direction and tonal or low-frequency content need a full propagation model, and local limits apply.

Formula and method

$$L_p = L_W - 10\log_{10}(2\pi R^2) - \alpha R, \quad L_{p,n} = L_p + 10\log_{10} n$$

Variables

L_W	Sound power level of one turbine	-
R	Distance from the hub to the receiver	m
α	Air absorption coefficient (dB per m; about 0.005 for A-weighted broadband)	-
n	Number of turbines at about this distance	-
L_{bg}	Background sound level (0 to ignore)	-
$L_{p,1}$	Level from one turbine (dB)	-
$L_{p,n}$	Level from all n turbines (dB)	-
L_{total}	Turbines plus background (dB)	-
ΔL	Increase over background (dB)	-

Method and standards

Hemispherical noise propagation.

Assumptions and limits

- Point sources over flat reflecting ground; broadband A-weighted levels.

References

Hemispherical spreading with air absorption

Report details

Report reference	FCC-310C-Z5GG (the same inputs always give the same reference)
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Release checks	3 reference cases of this calculator, computed independently, are checked on every release

Results are for engineering estimation. Verify critical designs against the referenced standards and your own data.

This calculator online

https://calc.firecad.com/environmental/wind-power/wind-turbine-noise-at-distance

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.