

Vertical Axis Wind Turbines



Vertical-Axis Wind Turbines (VAWT) are a modern invention borne out of a increasing desire for a wind turbine generator that can operate in an urban environment, where wind speeds may be low and turbulence from buildings is common.

Unlike Horizontal Axis Wind Turbines (HAWT's) they do not have to orientate themselves to face the wind as they utilize wind from any direction. Aluminium and composite resin blade designs ensures robustness and balanced rotor reduce vibration and noise making this type of wind turbine quiet in operation.

Ideally, the turbine should be sited away from buildings or trees, which may cause turbulence although this is not as strict a requirement as for HAWT machines and actual distance will depend upon a number of factors.

In certain cases the funnelling effect of wind flowing between buildings can be beneficial for VAWT's as wind speed close the ground increase, making short towers a positive advantage. They are also ideally suited for roof top mounting.

Wind speed is expressed as the annual mean wind speed (AMWS) and is an indication of how much wind energy is available in a typical year. An estimate of AMWS in meters per second (m/s) for each 1km square all over the British Isles for a height of 10m is available from a Government funded database so we will be able to estimate the approximate AMWS for the proposed site and therefore an approximate electrical annual output of the wind turbine.

VAWT designs vary, with single, twin and multiple blade rotors, blades can be straight or curved and are offered in a variety of materials, whilst advancements in electronics enable optimisation of power generation with varying conditions. Commercially available machines are only just entering the market and installations are few. The model illustrated is a UK manufactured VAWT rated at 5kW standing 11m with a rotor of 5m dia, and for 10kW rated output at 14m tall and 6m dia. The cut-in wind speed is an important factor to consider. These machines self-start at 3m/s, drawing a small amount of power from the grid to 'boot' the machine into action. Cost cutting features include the use of a standard Star/Delta AC motor running at 1500rpm, which eliminates the need for an inverter in the system.

In operation the blades rotate at up around 60rpm with an over-speed magnetic brake being activated at high wind speeds. The 5kW rated machine would be expected to generate around 10MWh of electricity/year at a site with AMWS of 7m/s, if the location is appropriate a 7.5kW generator can be fitted raising the annual output capability, whilst the 10kW rota on the taller tower would be expected to generate around 20MWh of electricity/ year at a site with AMWS of 7m/s.

Intelligent electronics enable systems to be commissioned for different site and wind characteristics which can be monitored remotely. Re-commissioning of a turbine after a period of initial operation could therefore be carried out to fine tune / optimize performance, either remotely or at the site.

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