

Wind Power

What is Wind Power?

Wind power results from the conversion of kinetic energy to mechanical energy or electricity.

The amount of power that can be harnessed from the wind depends on:

- Average annual wind speed
- Location, topography, and obstacles

These factors influence where a wind system can be located and how feasible it is to install a system.

Why Wind?

Technical Feasibility

The current interest in wind energy results from the need to develop clean, sustainable energy systems that can be relied on for long term use. Modern aerodynamics and engineering have improved wind turbines. They now provide reliable, cost effective, pollution free energy for individuals, communities, and national application.

The wind speed is the most important factor influencing the amount of energy a wind turbine can convert to electricity. Increasing wind velocity increases the amount of air passing the rotor, which increases the output of the wind system.

In order for a wind system to be effective, a relatively consistent wind flow is required. Obstructions such as trees or hills can interfere with the wind getting to the rotors. To avoid this, rotors are placed on top of towers to take advantage of the strong winds available higher up. The towers are generally placed 100 meters away from the nearest obstacle. The middle of the rotor is placed 10 meters above any obstacle that is within 100 meters.

A wind turbine works the opposite of a fan, instead of using electricity to make wind, wind turbines use wind to make electricity. The wind turns the blades, which spin on a shaft; the shaft is connected to a generator and produces electricity. The more air that passes by the blades, the faster the blades rotate, and the more electricity the wind generator will produce. A larger rotor area is able to collect more wind and produce more electricity with lower speeds.

Renewability

The sun heats the earth at different rates depending on whether the area is cloudy, clear, or under water. In warm areas the air rises and becomes less dense. The rising air creates a low-pressure area. Cooler air from adjacent higher-pressure areas move towards the lower pressure areas. This air movement is wind.

The wind is a renewable energy source, continuously generated or replenished by the forces of nature. Renewable energy technologies convert renewable resources into usable forms of energy that can complement or replace conventional energy sources.

Environmental Benefits

Wind energy is pollution free, infinitely sustainable form of energy based on weather systems. It does not use fuel, it does not produce greenhouse gases, and it does not produce toxic or radioactive waste.

Cost Effectiveness

In order determine if a wind energy system is feasible there must be an adequate wind supply. A wind energy system usually requires an average annual wind speed of at least 15 km/h. The following table represents a guideline of different wind speeds and their potential in producing electricity.

Average Wind Speed	Suitability
Up to 4 m/s (about 15 km/h)	No good
5 m/s (18 km/h)	Poor
6 m/s (22 km/h)	Moderate
7 m/s (25 km/h)	Good
8 m/s (29 km/h)	Excellent

Air is more dense in the winter than in the summer. Therefore, a wind generator will produce more power in the winter than in summer at the same wind speed. At high altitudes (in mountains) the air pressure is lower, the air is less dense, therefore less power.

What are Some Problems with Wind?

There are no problems with wind turbine technologies. Problems with wind systems are associated with wind supply and location. If the average annual wind speed does not meet the minimum wind speed requirements, the wind turbine will not operate or run efficiently. These problems also occur when the location is improperly sited because wind speeds are affected.

Low frequency noise is also a factor that needs to be considered with siting a wind turbine. The noise levels of the large turbines are very low in comparison to other sources producing noise at the same frequency (sonic booms, shock waves from explosions, etc.) and under the right circumstances, it can be heard or felt by nearby residents.

For More Information

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