

WIND ENERGY GLOSSARY

anemometer: An instrument used to measure the velocity, or speed, of the wind.

availability factor: The percentage of time that a wind turbine is able to operate and is not out of commission because of maintenance or repairs, typically greater than 98% for most modern wind turbines.

capacity factor: A measure of the productivity of a wind turbine, calculated by the amount of power that a wind turbine produces over a set time period, divided by the amount of power that would have been produced if the turbine had been running at full capacity during that same time interval. Most wind turbines operate at a capacity factor of 25% to 40%.

cut-in speed: The wind speed at which the turbine blades begin to rotate and produce electricity, typically around 10 miles per hour.

cut-out speed: The wind speed at which the turbine automatically stops the blades from turning and rotates out of the wind to avoid damage to the turbine (a user-defined operational parameter, usually 55 to 65 miles per hour).

distributed generation: The concept of using smaller, more dispersed generation facilities to produce power, rather than larger, centrally located power plants.

grid: Also termed transmission system, the network of power lines and associated equipment required to deliver electricity from generators to consumers.

hub: The central part of the wind turbine, which supports the turbine blades on the outside and connects to the low-speed rotor shaft inside the nacelle.

hybrid system: A combination of two or more energy-producing technologies (for our purposes, wind energy and, for example, a diesel generator, commonly used in remote areas). Because of the intermittent nature of the wind, a hybrid system allows wind energy to be supplemented by an alternate energy source when wind speeds are low. Hybrid systems are especially popular in remote areas that are not connected to the electricity grid. Photovoltaic and solar technologies are also used as alternate energy sources in a hybrid system.

kWh (kilowatt-hour): A unit of energy that measures the amount of power produced or used over a 1-hour time interval. A 100-watt light bulb operating for 10 hours would use 1 kWh of energy (100 watts \times 10 hr = 1000 Wh = 1 kWh).

met tower: Also termed wind monitoring system, a group of instruments (including anemometers and wind vanes) that collectively measure various meteorological parameters such as wind speed, wind direction, and temperature at various heights above the ground. Wind-monitoring stations are used to collect and store data over a period of time. Those data are then used to evaluate the wind resource at that location. Met tower is short for meteorological tower.

NREL (National Renewable Energy Laboratory): A U.S. Department of Energy research facility funded to research renewable energy technologies, such as wind, solar, biomass, hydro, and geothermal energy.

nacelle (pronounced na-sell): The structure at the top of the wind turbine tower just behind (or, in some cases, in front of) the wind turbine blades that houses the key components of the wind turbine, including the rotor shaft, gearbox, and generator.

net metering/net billing: A term associated with small turbine applications in which an individual or business chooses to generate all or a portion of its own electricity with a wind turbine. When the residence or business is consuming more electricity than it is producing for itself, the additional electricity is drawn from the power company. Conversely, when the energy production from the wind turbine is in excess of consumption, the electricity meter spins backwards. The electric company bills the consumer based on the net electrical usage over a given billing cycle (month or year). Under current federal law (PURPA, Section 210), utility companies are required to purchase excess electrical generation. If net billing is allowed in a given state, the consumer effectively receives credit for electricity generated at a retail or par value. If net billing/net metering is not allowed, the utility company purchases the excess electrical generation at a wholesale or "avoided cost" rate, which is currently lower than the retail electrical rate. Not all states have net billing/net metering policies in effect.

PTC (production tax credit): The result of the Energy Policy Act of 1992, a tax credit that applies to wholesale electrical generators of wind energy facilities based upon the amount of energy generated in a year. As it exists today, the PTC for generators of wind energy is \$0.015 per kWh of electrical production for the first 10 years of wind power plant operation.

RPS (renewables portfolio standard): A policy set by federal or state governments that a percentage of the electricity supplied by electricity generators be derived from a renewable source.

rated wind speed: The wind speed at which the turbine is producing its nameplate-rated power production (i.e., a 750-kW wind turbine would be outputting 750 kW of power). This rated wind speed varies by model of wind turbine but is usually about 30 to 35 miles per hour.

rotor: Comprises the spinning parts of a wind turbine, including the turbine blades and the hub.

tower: The base structure that supports and elevates a wind turbine rotor and nacelle. Modern turbines are typically constructed using a tubular steel tower. Older wind turbines and windmills used the lattice-type tower, which consists of a crisscrossed network of steel or wood members.

transmission system: Also termed grid, the network of power lines and associated equipment required to deliver electricity from electrical generators to consumers.

utility-scale wind turbine: The size of turbine typically utilized by wind energy developers to produce large amounts of electricity, currently ranging in size from 750 kW to 1.5 MW.

WPA (Wind Powering America): A U.S. Department of Energy initiative designed to promote the use of wind energy across the country, with the goal of quadrupling U.S. wind capacity by 2010, thereby generating enough energy to supply 3 million households annually. Under the WPA program, by 2020, 5% of the nation's electricity needs will be supplied by wind energy.

W (watt), kW (kilowatt), MW (megawatt): The base unit of power, a watt, is a measure of the rate at which work is being done (746 W = 1 horsepower). A kilowatt and megawatt are common terms used to describe the amount of power that can be generated by a wind turbine.

1 kW = 1000 W

1 MW = 1000 kW = 1,000,000 W

wind-monitoring system: Also termed met tower, a group of instruments (including anemometers and wind vanes) that collectively measure various meteorological parameters such as wind speed, wind direction, and temperature at various heights above the ground. Wind-monitoring stations are used to collect and store data over a period of time. Those data are then used to evaluate the wind resource at that location.

wind power class: A system designed to rate the quality of the wind resource in an area, based on the average annual wind speed. The scale ranges from 1 to 7, with 1 being the poorest wind energy resources and 7 representing exceptional wind energy resources.

wind power density: A way to define the amount of wind power contained in a given area for use by a wind turbine, measured in watts per square meter.

wind resource: The wind energy available for use based on historical wind data, topographic features, and other parameters.

wind rose: A circular plot used to define certain characteristics about wind speed and direction observed at a monitoring location. The wind rose plot is a circle divided into 8, 12, or 16 "pie wedges" that represent different directions, such as on a compass. The wind rose typically depicts three sets of data: 1) the percentage of time that the wind blows from a certain direction, 2) how much the wind from a certain direction affects the average wind speed at the location, and 3) how much the wind from a certain direction contributes to the energy content of the wind at a given location.

wind speed: Wind speed, or velocity, is simply the rate at which air particles move through the atmosphere, commonly measured with an anemometer.

wind vane: A device used to measure wind direction.



University of North Dakota
Grand Forks, North Dakota

