WIND TURBINE PARTS AND TERMS

1 Foundation
Buried several feet under the ground is the base of the turbine. Made of cement and reinforcing steel, the standard base for a 1.65-megawatt turbine is a 52 foot-by-52 foot octagon that is 7 feet deep, according to Xcel Energy. ***Interesting facts:*** To pour the base, it requires 278 cubic yards, or 28 truckloads of concrete. Each base weighs 1.13 million pounds and the weight of the reinforcing steel equals the weight of 11 crew cab four-wheel drive pickup trucks, or 57,000 pounds.

2 Tower
The tower consists of three parts: the base, the mid and the top. Each of the sections is made of tubular steel and is a different height and diameter. The tower starts off wide and tapers off at the top. ***Interesting facts:*** If the tower is 1 inch off-level at the base, by the time you reach the top, it is 9 feet off-level. For a 1.65-megawatt turbine, the tower stands more than 253 feet and weighs about 276,000 pounds. There are more than 600 bolts that hold the tower together.

3 Nacelle
The nacelle sits on top of the tower, and houses the "brains" of the turbine: the generator and gear box. It has a Fiberglass shell and, depending on the manufacturer, some nacelles are large enough to land a helicopter on. The nacelle also has the ability to spin around so that it can face the rotor into the wind. ***Interesting facts:*** The nacelles on the turbines near Dexter stand 12 feet tall and weigh more than 125,000 pounds.

Located within the nacelle:

Low-speed shaft
The low-speed shaft is turned by the rotor, and it connects to the gear box.

Gear box
The gear box connects the low-speed shaft to the high-speed shaft, increasing the speed from the low-speed shaft to a speed that can generate electricity.

High-speed shaft
The speed of this shaft drives the generator, ultimately producing electricity.

Generator
One of the most important parts of the turbine, the generator creates the power from the wind.

Brake
In case of a tornado, or if the wind is blowing too hard, the brake is used to prevent the rotor from turning.

Yaw drive
This wind turbine component turns the nacelle into the wind, so that the rotor can get the most out of the wind.

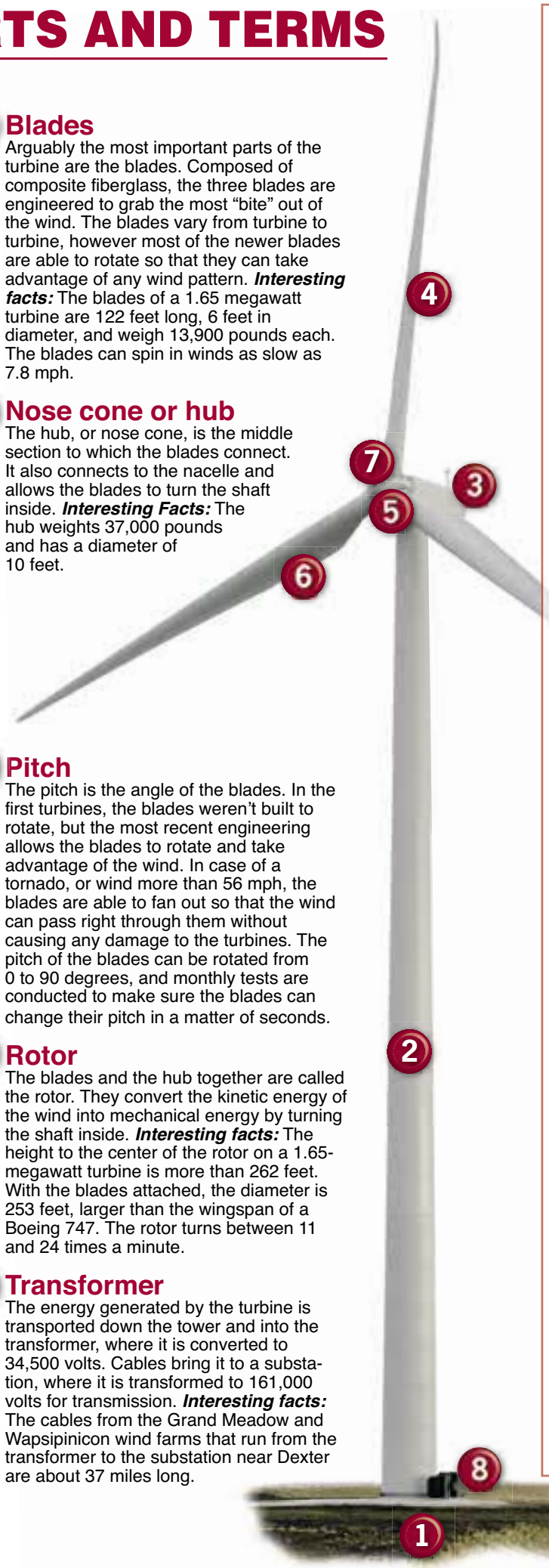
Located on the nacelle:

Anemometer
The anemometer measures wind speed.

Wind vane
The wind vane measures wind direction and tells the yaw drive which direction to face so it can get the most out of the wind.

4 Blades
Arguably the most important parts of the turbine are the blades. Composed of composite fiberglass, the three blades are engineered to grab the most "bite" out of the wind. The blades vary from turbine to turbine, however most of the newer blades are able to rotate so that they can take advantage of any wind pattern. ***Interesting facts:*** The blades of a 1.65 megawatt turbine are 122 feet long, 6 feet in diameter, and weigh 13,900 pounds each. The blades can spin in winds as slow as 7.8 mph.

5 Nose cone or hub
The hub, or nose cone, is the middle section to which the blades connect. It also connects to the nacelle and allows the blades to turn the shaft inside. ***Interesting Facts:*** The hub weights 37,000 pounds and has a diameter of 10 feet.



6 Pitch
The pitch is the angle of the blades. In the first turbines, the blades weren't built to rotate, but the most recent engineering allows the blades to rotate and take advantage of the wind. In case of a tornado, or wind more than 56 mph, the blades are able to fan out so that the wind can pass right through them without causing any damage to the turbines. The pitch of the blades can be rotated from 0 to 90 degrees, and monthly tests are conducted to make sure the blades can change their pitch in a matter of seconds.

7 Rotor
The blades and the hub together are called the rotor. They convert the kinetic energy of the wind into mechanical energy by turning the shaft inside. ***Interesting facts:*** The height to the center of the rotor on a 1.65-megawatt turbine is more than 262 feet. With the blades attached, the diameter is 253 feet, larger than the wingspan of a Boeing 747. The rotor turns between 11 and 24 times a minute.

8 Transformer
The energy generated by the turbine is transported down the tower and into the transformer, where it is converted to 34,500 volts. Cables bring it to a substation, where it is transformed to 161,000 volts for transmission. ***Interesting facts:*** The cables from the Grand Meadow and Wapsipinicon wind farms that run from the transformer to the substation near Dexter are about 37 miles long.

Base Load — The average amount of electric power that a utility must supply in any period.

Community-Based Energy Development, C-BED — C-BED projects are locally owned by farmers, investors, businesses, schools, utilities, etc., and keep more dollars in local communities, preserve local energy independence and protect the envrionment.

Capacity Factor — A measure of the productivity of a wind turbine, calculated by the amount of power that a turbine produces over a set period of time 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.

Electrical grid — An integrated system of electricity distribution, usually covering a large area.

Hub — The central part of the wind turbine that connects the turbine blades and the low-speed rotor shaft inside the nacelle.

Kilowatt (kW) — A standard unit of electrical power, equal to 1,000 watts.

Kilowatt-hour (kWh) — When you buy electricity, the power company charges you by the kilowatt-hours, or 1,000 watts in one hour.

Load — The demand on an energy-producing system; the energy consumption or requirement of a piece or group of equipment. Usually expressed in watts in reference to electricity.

Megawatt (MW) — A standard unit of electrical power, equal to one million watts.

Met-Tower — A meteorological tower that measures wind speed, wind direction and temperature at various heights. Included on the tower are anemometers and wind vanes to collect and store data.

Peak Demand/Load — The maximum energy demand or load in a specified time period.

Production Tax Credit (PTC) — A result of the Energy Policy Act of 1992, it is a commercial tax credit that applies to wholesale electrical generators at wind energy facilities based upon the amount of energy generated in a year.

Watt — A standard unit of electrical power.

Wind — Moving air, caused by differences in air pressure within the atmosphere. Air under high pressure moves toward areas of low pressure. The greater the difference in pressure, the faster the air flows and the higher the wind speed.

Wind option agreement — A contract between a landowner and wind developer that gives the developer the right, but not the obligation, to build a turbine on the land.

Wind easement agreement — A contract between a landowner and the wind developer that allows the developer to use the land for a specific purpose.

Wind Energy Production Tax — As part of the 2002 Minnesota Omnibus Tax Bill, the Legislature changed the way wind energy projects are taxed. The projects are exempt from property taxes and are instead required to pay a direct payment to the local taxing districts based on the electricity produced by the wind turbines. That tax is based on the size of the wind energy project.

Source: Interesting facts by Xcel Energy and The National Center for Atmospheric Research and the UCAR Office of Programs, Peter Tangren, Democratic Energy, Juhl Wind Inc. and the Energy Bible.com.