



Source: Crookwell and Internet

The Crookwell Wind Farm, NSW*

WIND FARMS & GENERATORS

What are Wind-driven Turbine Generators (WTG)?

Wind-driven turbine generators (WTG) can be used to produce electricity. The wind causes the **turbine** and the turbine shaft to turn. A **wind vane** is used to make sure that the turbine always points into the wind. The turbine shaft is connected to the alternator which produces electricity. Some of the wind's energy comes from the sun. The sun heats the earth's surface, then heats the air above it. The warm air becomes relatively lighter, or less dense, and rises. Cooler, denser air moves in to take its place. This movement of air causes wind. Other things, such as the shape of the land and the turning of the earth on its axis, also drive wind.

A wind generator should be located in an area that has a strong and steady wind, with an average speed greater than 25 kilometres/hour.

The world

Britain and Europe, including Germany, Denmark, Spain, and the Netherlands, produce 65 per cent of the world's wind-generated electricity. North America produces 22 per cent of the world's wind-generated electricity, and Asia (including Australia) produces 12 per cent. Wind electricity-generating farms are now being established worldwide.

How does a wind turbine make electricity?

The simplest way to think about this is to imagine that a wind turbine works in exactly the opposite way to a fan. Instead of using electricity to make wind, like a fan, turbines use the wind to make electricity.

Almost all wind turbines producing electricity consist of rotor blades that rotate around a horizontal hub. The hub is connected to a gearbox and generator, which are located inside the nacelle. The nacelle is the large part at the top of the tower where all the electrical components are located.

Most wind turbines have three blades that face into the wind; the wind turns the blades round, this spins the shaft, which connects to a generator and this is where the electricity is made. A generator is a machine that produces electrical energy from mechanical energy, as opposed to an electric motor that does the opposite.

How strong does the wind have to blow for the wind turbines to work?

Wind turbines start operating at wind speeds of 3 to 4 metres per second (around 10 km per hour) and reach maximum power output at around 13 metres per second (around 45 km per hour). At very high wind speeds, that is gale force winds 25 metres per second (90 km per hour) wind turbines shut down.

Why don't wind turbines have more blades?

People often wonder why there aren't more blades on wind turbines. The optimum number of blades for a wind turbine depends on the job the turbine has to do. Turbines for generating electricity need to operate at high speeds, but do

not need much torque or turning force. These machines generally have three or two blades. On the other hand, wind pumps operate with plenty of torque but not much speed and therefore have many blades.

How fast do the wind turbine blades turn?

The blades rotate at anything between 15-50 revolutions per minute at constant speed. However, an increasing number of machines operate at variable speed.

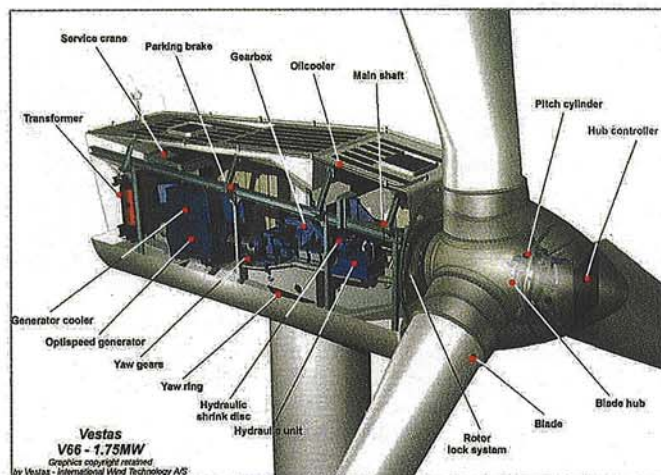
How much space do wind turbines require?

A typical wind farm of 20 turbines might extend over an area of one square kilometre, although less than two per cent of the land area would be taken out of use, the remainder can be used as before.

What happens when the wind stops blowing?

When the wind stops blowing, electricity continues to be provided by other forms of generation, such as gas. Our electricity system is mostly made up of large power stations, and the system has to be able

to cope if one of these large plants goes out of action. It is possible to have up to 10 per cent of the country's needs met by intermittent energy sources such as wind energy, without having to make any significant changes to the way the system operates.



Vestas V 66. Gearless Wind Turbine Specifications

Height of turbine towers (to rotor hub), 67 meters; Length of blade, 33 meters; Number of blades per turbine, 3

Type of tower: Tapered steel tube ; Connection to power grid: via a new substation and feeder line, connection to network is owned by TXU. Number of turbines for Toora Wind Farm: 12 (1.75 Megawatts each, and 21 Megawatts total).

TooraWind will produce enough electricity to power more than 6,600 homes, and prevent the release of approximately 48,000 tonnes of greenhouse emissions per annum.

More at: www.actewagl.com.au
<http://www.science.org.au/nova/037/037key.htm>

*THE CROOKWELL WIND FARM

Eraring Energy is a NSW based generator engaged in production and sale of electricity in the National Electricity Market, using coal-fired, hydro and wind generation. Their two Wind Farms are at Crookwell, in the upper Lachlan Shire near Goulburn, and further west at Blayney.

Each year the Crookwell Wind Farm will save around 8,000 tonnes of carbon dioxide emissions that would otherwise be produced from coal-fired generation.

At full output the 8 turbines, each of 600kW capacity, will be capable of meeting the average electricity demand of 3,500 homes. Each turbine stands 45m high with 44m diameter blades and can revolve up to 29 rpm. The turbines require a least 15 kph wind speed to start generation and cut out automatically over 72kph wind speed.