

How do wind and water generate electricity? – I

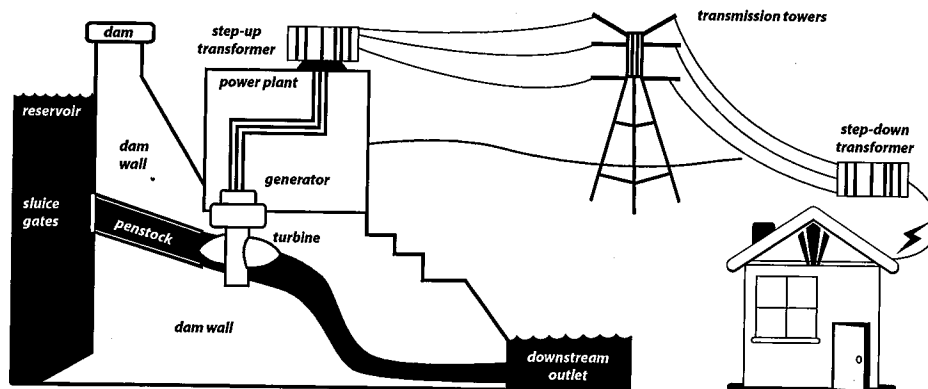
We all know what water is, but what exactly is wind? Wind is created by the sun. Land absorbs heat energy from the sun and warms the air around it. As the warm air rises (because it is less dense than cool air), cool air rushes in to take its place. This fast moving air is wind.

So how can water and wind generate electricity? The answer is all about the transfer of energy. Everything has energy of some form. It can't be created or destroyed, but it can be converted from one form to another when it is transferred between things.

When water is lying still in a reservoir, it has potential (stored) energy. But when it is rushing down towards the turbines of a hydro-electric power plant, the potential energy is converted to kinetic (moving) energy. In the same way, still air has potential energy that is converted to kinetic energy when a wind develops. To turn the huge blades on a tower, wind speeds need to be at least 15km/h.

To look at, hydro-electric power plants and wind farms are very different but the way in which they generate electricity is very similar.

When moving water or wind hits the blades of a turbine, the kinetic energy converts to mechanical energy and causes the blades to move. The turbine is attached to a shaft. As the blades turn, their mechanical energy is converted to rotational energy, causing the shaft to spin. The spinning shaft is attached to a generator, which is a magnet surrounded by copper coils.



The principle of electromagnetism is used to generate electricity. Just as a current in a wire generates a magnetic field around itself, so a moving magnetic field generates a current. Inside the generator, a magnet spinning inside a coil of copper wires generates a current in the coil—electricity!

Electricity loses some of its power as it travels over a distance. To make sure it still has enough power when it reaches its destination, a step-up transformer boosts its voltage to a very high level. Huge metal towers called transmission towers support insulated cables that carry the electricity at this dangerously high voltage. Before it is connected for use, the electricity is passed through a step-down transformer, converting it to lower voltages that are safe for domestic and commercial use.

