

How Most Electricity is Made



What do wind, coal, steam, natural gas, sunlight and uranium have in common? While it may not seem obvious at first, they can all be used to produce electricity. The sources of energy for electricity production are of two types; those from renewable sources and those from non-renewable sources.

Renewable sources are those that will be naturally replenished on a human timescale, which means that humans will see them restored and renewed within their lifetimes. These sources include water (tides, rain, lakes, and rivers – often referred to as hydro), wind, light, geothermal heat and biomass/biogas. Non-renewable sources will not be renewed in a rate that humans will witness; they take far too long to be restored. These include coal, oil, natural gas and nuclear.

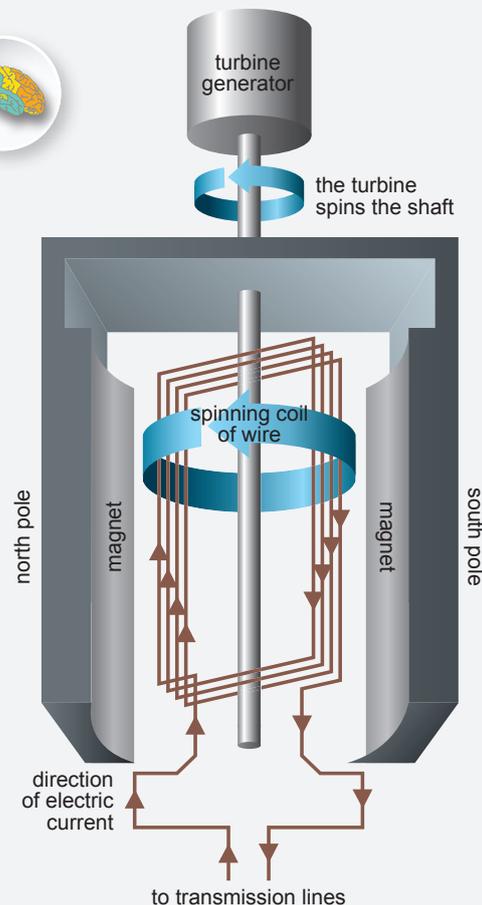
The modern world is favouring the use of renewable sources because non-renewable reserves are quickly diminishing and they produce a huge amount of pollution. While the source of energy may differ, the process by which electricity is made is much the same.

All power stations contain large turbines. A turbine has many blades attached to an axle which turn very quickly because of a flow of water, steam, air or other fluid through it. The turbine turns a generator which produces the electricity. The generator contains a coil of copper wire that is spun by the turbine within a set of large powerful magnets. This causes electrons to move in the wire generating an electric current. This current is sent to a transformer, which increases the voltage to over 220,000 volts. This is done to save energy and transmission costs. It might seem strange increasing voltage to save energy but it works because with a higher voltage, a lower current can be used to deliver the same amount of energy. Less current means fewer electrons bumping along the power line wires. This wastes energy because the more collisions, then more electrical energy will be converted to heat in the wires.

If this high voltage was used in our houses, it would destroy all the appliances because household appliances run on around 240 volts (V). To prevent this, suburbs, towns and streets have transformers that reduce the voltage and make it safe to use. Electrical energy is converted inside appliances into other forms of energy, such as heat and light in a light bulb or sound in a stereo. No matter how it is generated or what source it comes from, electricity is electricity, it is all the same.

Up to 80% of the electricity produced on Earth is made using a steam turbine. This is a turbine that is powered (turned) by super-hot/high-pressure steam. The steam is produced by heating water with burning coal, fission of nuclear elements such as uranium, using the Sun's heat, burning biomass materials (plant matter or animal waste) or burning biogas (which is mainly methane from rotting plant and animal material). The other way to get steam is from deep inside the Earth's crust which is very hot. Steam from this area of the Earth is called 'geothermal steam'. Other methods for turning turbines include burning natural gas (gas products turn the turbine), wind (gusts of wind turn a turbine) or water. Hydroelectric dams use the energy of water falling due to gravity to turn their turbines; some power stations rely on the rise and fall of tides to turn theirs. The Sun's light can also be used to produce electricity without turbines. Special materials in solar electric panels produce voltages and current when light shines on them.

In New Zealand, we rely mostly on hydroelectric dams to produce our power. 55% of electricity produced in 2012 was from these dams and in the South Island they use 98% hydro. Other sources used in New Zealand include: 19% natural gas, 8% geothermal steam, 2% oil, 7% coal, 6% wind and 3% other (biomass, like wood and biogas). Other countries use the various sources of energy in different amounts, depending on the resources that are available to them. For example, a country with little water but long sunshine hours could rely more heavily on solar production. Below are three tables for three different countries and their electricity production.



France (2012)		India (2013)		Norway (2010)	
nuclear	77%	coal	59%	coal and oil	42%
hydro	10%	hydro	17%	hydro	36%
natural gas	4%	natural gas	9%	nuclear	21%
coal	4%	nuclear	2%	biomass	0.5%
oil	0.5%	oil	1%	wind	0.5%
other renewable (wind and solar)	4.5%	other renewable (wind)	12%		

Note: Some countries, such as France, sell and export electricity to other countries nearby them. Data courtesy of Bluenomics.com.