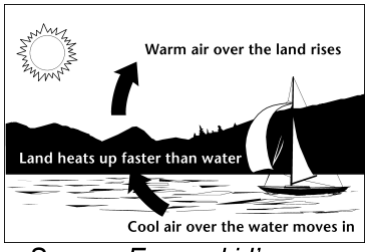
Student A: WIND ENERGY

Wind occurs when the Sun heats the Earth and the air above land gets hotter than the air above water.

The hot air above land rises upwards leaving an area of low pressure. Cooler air moves into this area of low pressure producing wind.



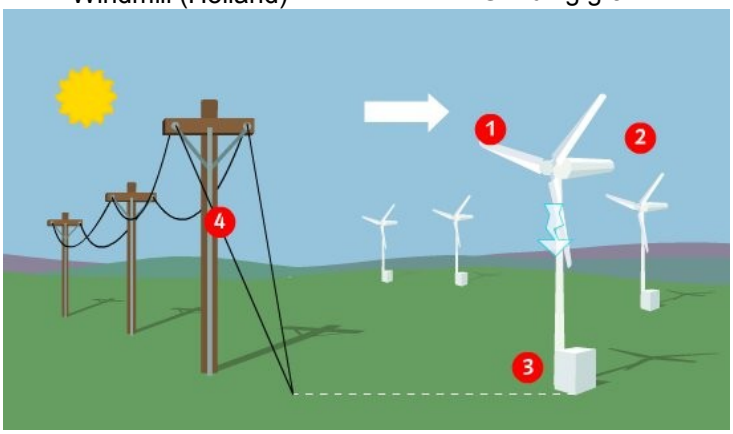
Source: Energy kid's page

Wind power has been used for hundreds of years for sailing, grinding grain, pumping water and for irrigation. For example, in Holland, it was used to turn **windmills** to grind wheat into flour.

Windmill (Holland)

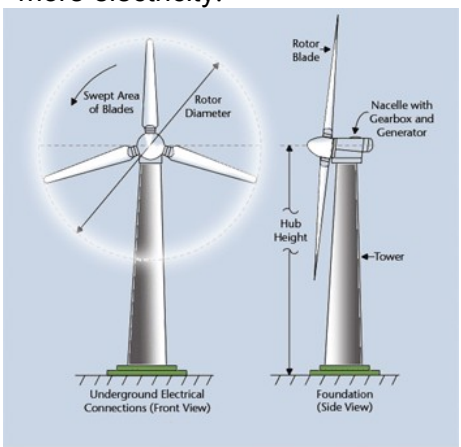
Grinding grain

Wind turbines in a wind farm



Today, the wind is also used to make electricity by means of **wind turbines**. A wind turbine turns wind into electricity. It consists of a nacelle, rotor, tower, foundation and transformer. The wind turns the rotor of the wind turbine. The rotor turns a generator (a dynamo), which makes electricity.

We tend to build many of these towers together, to make a "**wind farm**" and produce more electricity.



Drawing of the rotor and blades of a wind turbine, courtesy of ESN

The best places for wind farms are in coastal areas, at the tops of rounded hills, open plains and gaps in mountains - places where the wind is strong and reliable. To be worthwhile, you need an average wind speed of around 25 km/h. Once electricity is made by the turbine, the electricity from the entire wind farm is collected together and sent through a transformer. There the voltage is increased to send it long distances over high power lines.

Source: http://www.daviddarling.info/

Student B: HYDROPOWER

Hydropower is energy from water sources such as the ocean, rivers and waterfalls. Because the source of hydropower is water, hydroelectric power plants must be located on a water source. Water wheels have been used as an energy source for thousands of years, mainly to grind cereals such as wheat to produce flour.


Grinding wheat


Water wheel

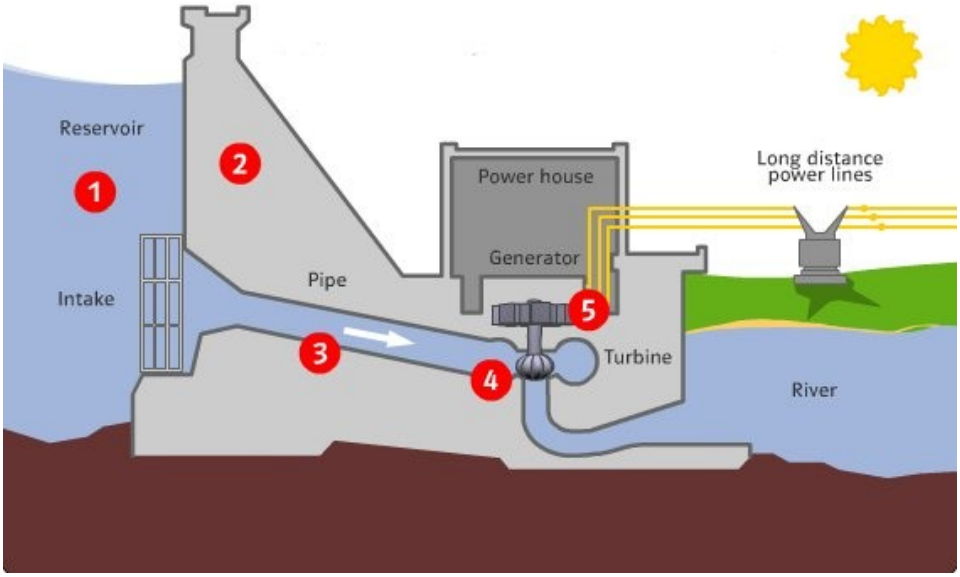
Electricity (or hydroelectricity) is produced by directing or channeling moving water to power electric generators. The flow or fall of the moving water determines the amount of energy available.


A dam

Dams are built to trap water, usually in a valley where there is an existing lake. The water flows through tunnels and turns the turbines which drive generators which make electricity.

The dam is much thicker at the bottom than at the top, because the pressure of the water increases with depth.

Hydro-electric power stations can produce a great deal of power very cheaply.



Source: E.ON UK

Student C: GEOTHERMAL POWER


Hot spring in Costa Rica

"Geo" means earth, and "thermal" means heat. So, geothermal means earth-heat. The Earth's heat is called geothermal energy.

The centre of the Earth is around 6000 ºC - easily hot enough to melt rock. Even a few kilometers down, the temperature can be over 250 ºC.

Geothermal direct use dates back thousands of years, when people began using hot springs for bathing and cooking food. Today, hot springs are still used as spas.

But there are now more sophisticated ways of using this geothermal resource.

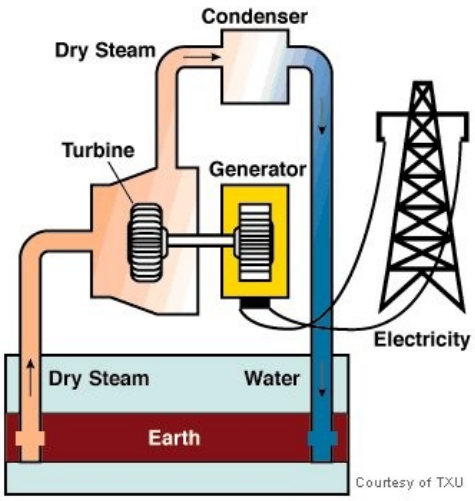
- **HEAT:** In modern direct-use systems, a well is drilled into a geothermal reservoir to provide a steady stream of hot water. The water is brought up through the well, and a mechanical system delivers the **heat** directly for its intended use.

  Geothermal hot water can be used for many applications that require heat. Some examples are heating swimming pool water, growing plants in greenhouses, drying crops, heating water at fish farms, and several industrial processes, such as pasteurizing milk.

- **ELECTRICITY:** Hot water or steam from below ground can also be used to make electricity in a geothermal power plant.

A geothermal power plant is like a regular power plant except that no fuel is burned to heat water into steam.

The steam or hot water is heated by the earth. It goes into a special turbine. The turbine blades spin and the shaft from the turbine is connected to a generator to make electricity. The steam then gets cooled off in a cooling tower.



Producing electricity in a geothermal power plant

Geothermal energy is an important resource in volcanically active places such as Iceland and New Zealand.