Contributor

CLEAN ENERGY COUNCIL

www.cleanenergycouncil.org.au

Clean Energy

Facts for Students

Clean energy refers to sources of energy that emit no or little carbon dioxide. There are numerous sources of clean energy such as bioenergy, hydroelectricity, wind energy and more.

What is clean energy and why do we need it?

Clean energy is any source of energy that has no or low carbon dioxide *(CO_2)* emissions.

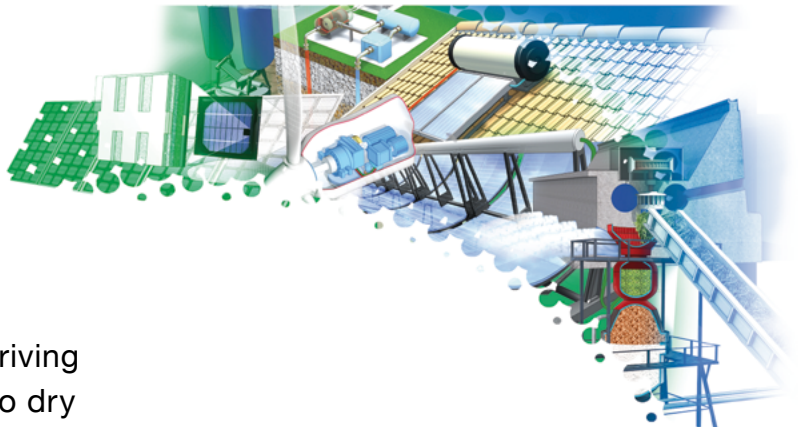
In Australia we have some of the world's best clean energy sources and many of these are already supplying power to homes. Energy sources such as wind power and solar power have the capacity to meet the growing energy needs of Australia without contributing to greenhouse gas emissions.

So why do we need clean energy? Well, Australia is at risk of suffering the harmful effects of climate change if we do not make changes to the way we produce and use energy. Currently, 50 per cent of all greenhouse gas emissions in Australia are a result of the stationary energy sector *(this includes electricity generation, fuels consumed in manufacturing, construction and other commercial industries and domestic power use such as heating and cooling)*. We need to make a change to protect the environment.

Being energy efficient

Being energy efficient means reducing our overall demand for energy. Believe it or not, simply using energy efficiently has the potential to cut greenhouse gas emissions by up to 80 percent by 2030.

The average Australian household is responsible for generating over seven tonnes of emissions each year. Making small changes to how you use *(or do not use)* energy can have a big impact on reducing greenhouse gas emissions.



Being energy efficient can be as simple as:

- changing your light globes to low-energy globes
- turning appliances off at the power point
- buying products that are grown or produced locally
- recycling or reusing items
- walking or riding your bike instead of driving
- using the natural energy from the sun to dry your clothes or warm you up.

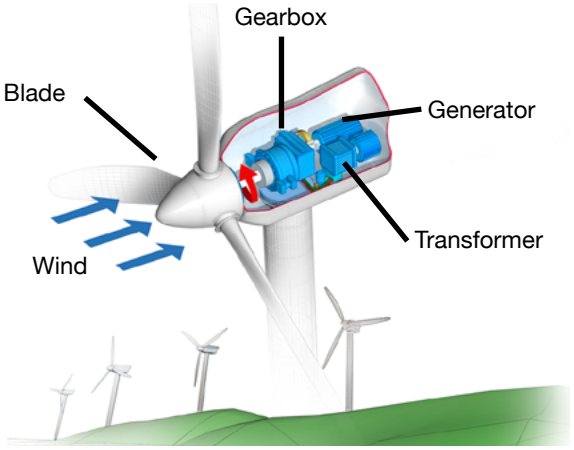
Being energy efficient can include bigger projects, such as installing insulation at home, using solar hot water heaters, ensuring that your home has shade *(from blinds, trees etc.)* in summer, but allows the sun through in winter, and connecting homes to clean energy electricity sources.

Types of clean energy

Wind energy

A wind turbine captures the energy of the wind and converts it to electricity as follows:

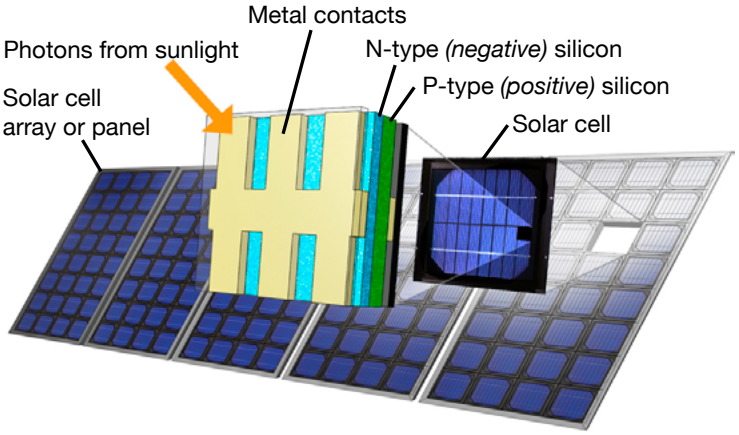
1. The force of the wind causes the outer blades of the turbine to turn.
2. This motion is transferred through a gearbox into a generator.
3. The generator produces electricity which is fed through a transformer to a substation.



Areas that have strong, consistent winds are the most appropriate locations for wind farms. South Australia has some of the best locations for wind farms *(a group of wind turbines located together)* in the country.

Solar photovoltaic power

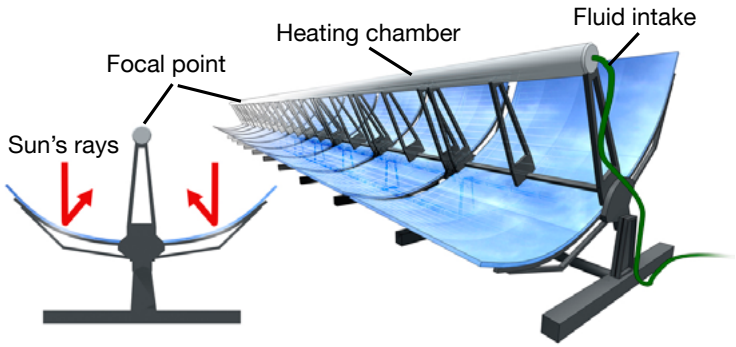
Solar photovoltaic *(PV)* refers to the panels that you may see installed on the rooftops of homes and businesses. Solar PV is like having a mini-power station on your roof because it can supply power without being connected to an electricity grid. This makes it an excellent source of energy for remote areas. Australia has the highest average solar radiation of any continent. This means we have the potential to lead the world in solar energy generation.



Solar thermal energy

Solar thermal involves using the sun's energy to generate electricity. It is done by using large, polished metal mirrors that reflect the sun's rays to heat a liquid and create steam which spins a turbine that powers a generator to produce electricity.

Another form of solar thermal energy is known as ‘passive thermal energy’. This simply involves using the heat from the sun to do things such as dry our clothes or warm us up in cold weather.



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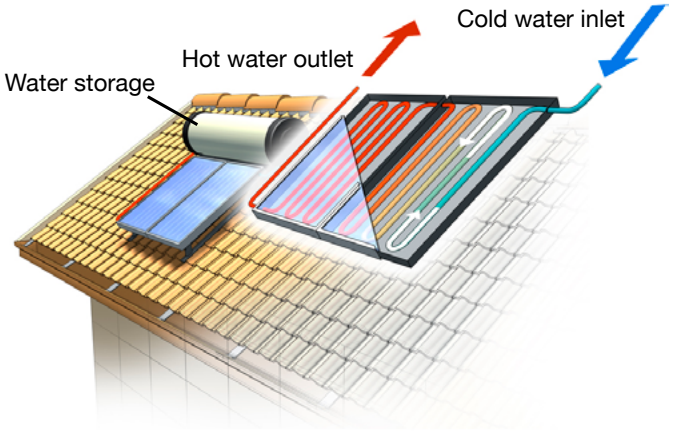
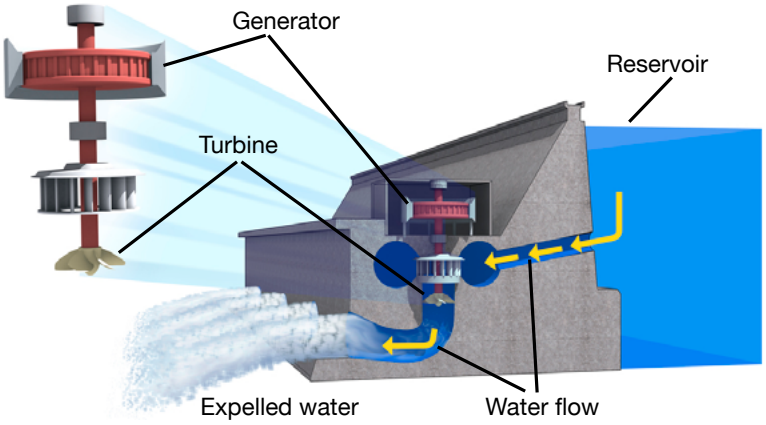
Solar water heating

A solar water heater uses energy from the sun to heat water. Solar water heaters have a water storage tank and solar panels that are usually fitted onto the roof of a house. Cold water flows into the inlet at the top of the heating panels. The clear flat panels act like a solar oven, trapping the sun's radiation between the layers. As the water passes through the tubing under the panels it is heated, so it is hot when it flows into the storage tank. Even in cooler parts of Australia, solar energy can supply up to 80 per cent of the energy needed to heat water.



Hydroelectricity

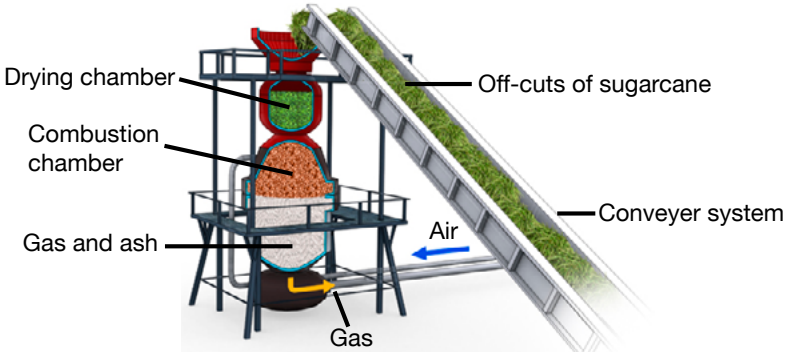
Hydroelectricity uses the energy of flowing water to produce electricity via a hydroelectric power station. The force of flowing water is used to spin a turbine and operate a generator to produce electricity.



Bioenergy

Bioenergy is energy, such as electricity or thermal energy, produced using biomass *(organic matter)*. There are several ways to capture energy from biomass, such as burning organic matter, such as sugar cane, collecting the gas released through this process and using it to run a generator which produces electricity.

Interestingly, this form of bioenergy is carbon neutral, meaning that the amount of carbon dioxide *(CO_2)* released into the atmosphere while the waste is being burnt is the same as the amount of CO_2 the sugar cane will absorb while it grows. Now, that's good for the environment!



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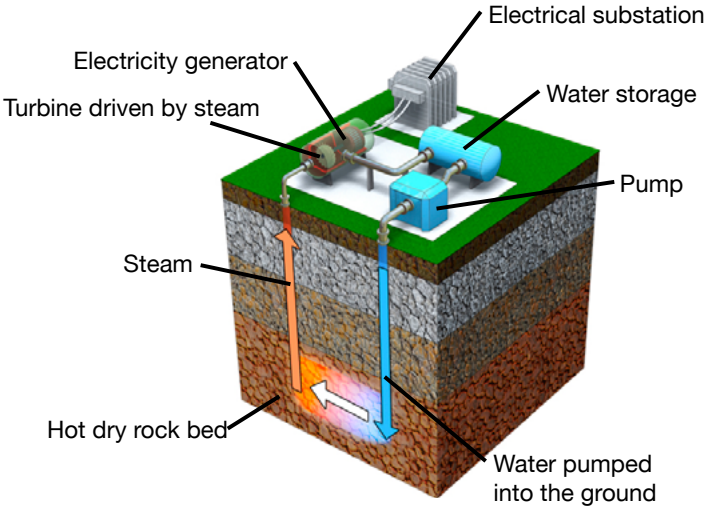
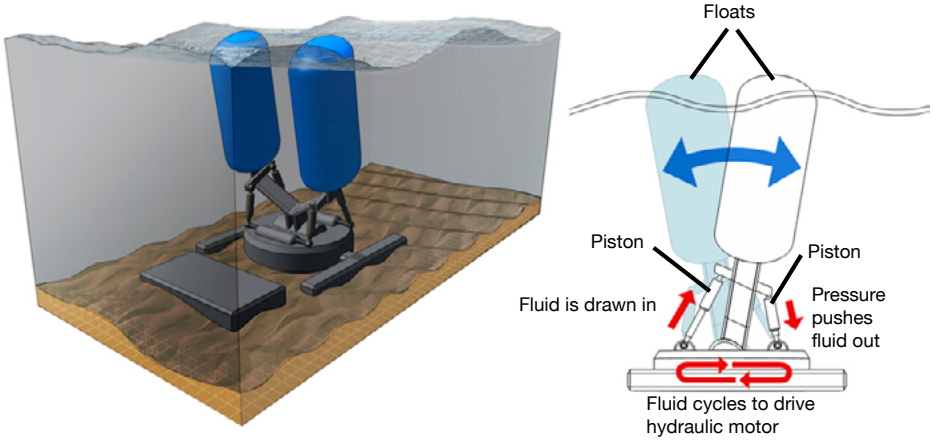
Geothermal energy

Deep below the Earth's surface, heat is generated in special granite rocks, and trapped by layers of insulating sedimentary rocks. Geothermal energy is produced by using this naturally occurring heat to generate electricity. Wells are drilled to a depth of three to five kilometres, water is pumped into the wells and through cracks in the rocks, the heat of the rocks causes the water to be heated and turn to steam which turns a turbine to produce electricity. The steam is condensed back into water and used again.



Ocean power

Ocean power uses the ocean's tides, currents or waves to generate electricity. A device with 'floats' is mounted on the sea floor. The 'floats' move back and forth with the natural movement of the ocean, which powers a motor to produce electricity.



Clean Energy fast facts

- In 2009, wind energy generation saved over four million tonnes of carbon dioxide *(CO_2)* from entering the atmosphere in Australia. That is the same as taking about 950,000 cars off the roads!
- Have you ever seen a telephone box with solar panels on the roof? Many phone boxes in rural areas are powered like this.
- Did you know that hydroelectric power stations deliver the majority of Australia's renewable energy? There are more than 100 hydroelectric stations around the country.
- People have used crop waste, animal waste and wood to heat their homes and cook their food for thousands of years, so using biomass to produce energy is certainly not a new idea.
- Geothermal power is a zero-emission electricity source and one megawatt hour *(MWh)* of geothermally-derived electricity prevents about one tonne of carbon dioxide *(CO_2)* from being released into the atmosphere.
- Did you know that the temperature differences in the ocean can be used to generate electricity? The warm surface waters can be used to make steam, which is passed through a turbine generator to make electricity.