

SOLAR

What is solar energy?

Solar energy technologies harness the sun's rays to create energy. Every year, the sun produces approximately 1,366 watts of power per square metre of the earth's surface.

Solar energy is a fast growing way to harness power, and some experts think it will contribute to 50% of the total world's energy use by 2050.



AN EXAMPLE OF A SOLAR FARM IN CALIFORNIA.
SOURCE: PROMETHEUS.ORG

What types of technology harnesses solar energy?

There are two types of solar energy devices available today:

- solar thermal converters
- solar photovoltaic converters

How is electricity generated from solar energy?

Solar thermal converters: Solar thermal converters are the oldest systems of collecting energy from the sun. Thermal converters use dark coloured panels and sometimes reflector panels placed on areas such as rooftops, to absorb the heat from the sun. The panels collect heat which in turn heats fluid, such as oil or water. As this heated fluid travels through the panel, it absorbs the sun's heat energy and produces hot liquid, or even steam. If steam is produced, the steam turns a turbine, creating rotational energy that is converted into electricity by a generator.

As thermal converters need heat to create energy and require warmer temperatures, they work best in areas closer to the equator.

Solar photovoltaic (PV) converters: Solar PV converters convert sunlight energy into electricity. A typical PV panel consists of two or more thin layers of semi-conducting material, which is commonly silicon. PV cells are connected together and encapsulated, to form a module or panel. Incoming solar rays are captured by the solar panels. When light strikes the silicon, it produces electrons that are conducted away by a metallic grid as direct current (DC). This is then sent through an inverter and converted into alternating current (AC) electricity for use in the home, or at school.



As PV converters convert light energy into electricity, they can be used in cooler climates. Cloudy weather will limit the amount of energy collected.

What are the advantages of solar energy?

Solar energy is a renewable energy resource that can work in many weather situations. Obviously the more sunshine hours a place receives, the more energy generated.

Solar PV converters are one of the most environmentally-friendly ways to generate power today because they are silent, produce no emissions, and require no fuel to run them.

What are the disadvantages of solar energy?

Producing electricity using solar energy is expensive compared to the more traditional methods. This is because solar converters have a limited generation output, which means low electricity production. You need to install solar panels over a very large area in order to get as much heat and light as possible. Also because solar uses the sun, generating electricity is weather dependent and output levels change from day to day – so it's not a very reliable energy source, especially over the winter period when the days are shorter.

How is solar energy used in New Zealand?

There are currently no large-scale

commercial solar farms in New Zealand. There are however, many independent examples around New Zealand, where businesses and households use solar energy to heat water or generate power.

New Zealand receives about 2000 hours of bright sunshine every year. This is enough sunlight to generate approximately 4kW per square metre every day.

ACTIVITIES

ACTIVITY ONE

Look around your school. List examples of items that might use solar energy, e.g., a solar calculator, solar garden lights.

ACTIVITY TWO

Students research what photovoltaic stands for and why photovoltaic converters don't need the sun's heat energy to work.

SUPPORTING RESOURCES

- Australia and New Zealand Solar Energy Society: www.anzsos.org/
- Energy Efficiency and Conservation Authority: www.eeca.govt.nz
- Schoolgen Teacher Resources: www.schoolgen.co.nz

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