

SOLAR

What is solar energy?

Solar energy technologies transform the energy in sunlight into electrical and thermal (heat) energy. The earth's surface receives approximately 1000 watts of power from the sun for every square metre facing the sun.

Solar energy is a rapidly growing way to generate electricity, and it is estimated by the International Energy Agency that solar energy will produce nearly a quarter of the world's total energy use by 2050.



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

What types of technology harnesses solar energy?

Solar energy devices available today can be put into two major classes:

- solar thermal collectors
- solar electricity

How is energy collected from the sun?

Solar thermal collectors:

These are the oldest systems of collecting energy from the sun and make use of the heat or thermal energy in sunlight. Solar thermal collectors use dark coloured panels placed on areas such as rooftops to absorb the heat from the sun. The panels collect heat, then transfer this heat to fluids circulating through the panel. This is a clean and efficient way to heat hot water. Some solar thermal collectors use the sun's energy to boil water into steam. The high pressure steam spins a turbine, creating rotational energy that is then transformed into electricity by a generator.

Solar Electricity

Solar electricity systems are usually called photovoltaics (PV) because they transform light 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. 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 do useful work in many situations. Obviously, the more sunshine hours a place receives, the more energy generated.

Photovoltaics are one of the most environmentally-friendly ways to generate power today because they are silent, produce no emissions while in use and require no fuel to run them.

What are the disadvantages of solar energy?

Producing electricity using solar energy is currently more expensive when compared to the more traditional methods. One reason for this is because PV panels have a limited ability to transform all the energy in sunlight into electricity, which decreases the electricity production. To compensate for this, panels must cover a larger area to collect more sunlight. Also because solar technologies use 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 electricity.

Through the Schoolgen programme Genesis Energy has installed a 2kW PV system in 42 schools across the North Island. New Zealand receives about 2000 hours of bright sunshine every year. This is enough sunlight to generate nearly 4kWh of electrical energy per kilowatt of panel 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 photovoltaics 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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