schoolgen
Power to the next generation

HELLO TOMORROW | genesis ENERGY

SCHOOLGEN ACTIVITIES

HOW A SOLAR ELECTRICITY SYSTEM WORKS

Teacher-led Activity

This activity gives the students an understanding of the physical processes and energy transformations involved in the generation of electricity using a system based on a solar panel, and the meaning of the Schoolgen data readings in terms of energy output.

This activity ties in with the curriculum focus on different forms of energy, and the Principle of Conservation of Energy, which is the central principle of elementary physics, i.e., energy cannot be created or destroyed, but through physical process may be transformed from one type to another, without loss.

With the support of

Ministry for the Environment
Manatū Mō Te Taiao
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HOW A SOLAR ELECTRICITY SYSTEM WORKS

INTENDED LEARNING OUTCOMES

Students will:

- identify and discuss the functions of the components of a solar electricity generating system
- understand, at an elementary level, the processes involved in generation of electricity by a photovoltaic cell
- discuss the energy transformations involved in solar-electricity generation in terms of the Principle of Conservation of Energy
- interpret the Schoolgen data output from their school's solar panels in terms of energy and power.

WHAT YOU NEED

- Activity 1: Role Play.
  Cut up and laminate the cards in Activity 1 for each group of eight students.

- Activity 2: Cloze Exercise.
  Print a copy of the Cloze Exercise for each student. Alternatively, this gap exercise could be written on the board for students to copy down.

FOCUS

- What energy transformations occur in the generation of electricity from solar energy?
- What are the components of a solar electricity system?

MANAGING THE ACTIVITY

Activity 1: Role play

Here is the order of physical processes which simulate how solar electricity generation works:

1. Nuclear fusion
2. Solar radiation
3. Solar panel
4. Release of electrons in Si crystal
5. Inverter
6. Transformer
7. National Grid (or pylon)
8. Electricity (domestic appliance/outlet).

Place the students in groups of eight. Give each group member a card with a labelled diagram. The students have five minutes to decide on the order of physical processes and explanations which simulate how solar electricity generation works. Each group role plays how they think solar electricity generation works to the class. Each group compares their role play with the other groups and notes the similarities and differences.

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Activity 2: Cloze Exercise

Prior to this exercise, students will need to read How a solar (photovoltaic) cell converts solar energy to electricity.

Ask the students to read the passage in the Cloze Exercise and to fill the gaps in. The answers are provided in the box below.

Answers (in order):
Nuclear fusion, Sun, electromagnetic waves, violet, light, red, absorbed, silicon, electrons, current, circuit, direct current, alternating current, inverter, National Grid, transformer, alternating, direct, rectifier, solar, electrical, heat.

REFLECTION

As a class:

- discuss how solar electricity generation works
- brainstorm environmental factors that affect how much energy is produced by the solar panel
- discuss which factors have the most effect on the efficiency of the solar panel.

When students have completed the Cloze Exercise, ask them to identify:

- all the forms of energy mentioned in the passage
- how many are really different forms of energy
- the energy transformations and the processes by which energy is transformed.

EXTENSION

A research based exercise where the students search the Schoolgen website (www.schoolgen.co.nz) to find out how a solar electricity generation system works. How a solar (photovoltaic) cell converts solar energy to electricity. Using the information gathered, the students create their own information sheet for the school community explaining how the Schoolgen solar panels work.

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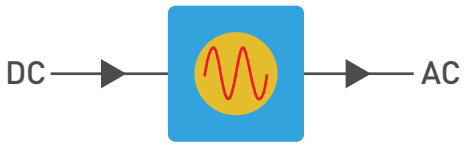
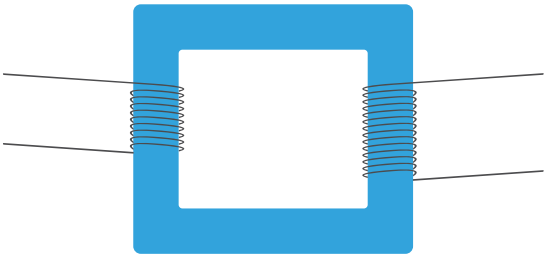
Inverter



Solar panel

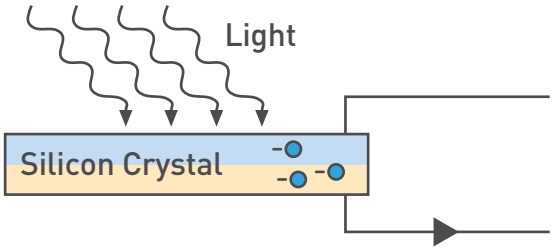
National Grid

Transformer

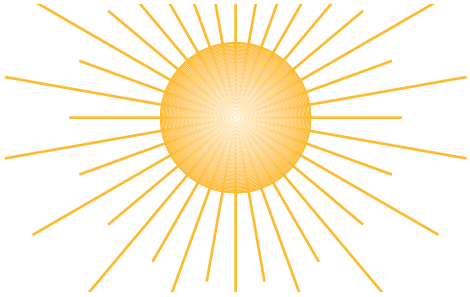


Nuclear fusion

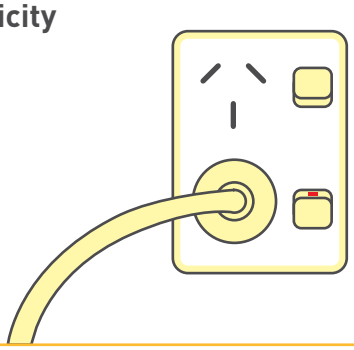
Electrons released



Solar Radiation



Electricity



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CLOZE EXERCISE

Fill the gaps in the paragraph below using the following list of words:

National Grid, violet, sun, light, red, silicon, absorbed, current, circuit, electromagnetic waves, direct current, alternating current, alternating, direct, rectifier, solar, electrons, inverter, electrical, heat, Nuclear fusion, transformer.

Solar energy originates from _____ in the core of the _____. It is radiated through space as _____, which are mainly ultra-_____, visible _____ and infra-_____ radiation. When solar energy is _____ by the layers of _____ crystals in solar cells, _____ are released and these can produce a _____ in an electric _____. Initially this is a _____ but it is usually converted to _____ by an _____ before being transmitted on the _____. In addition, a _____ is required to increase the voltage at which the electricity is transmitted. Most household appliances use _____ current, but some use _____ current and so need a _____. Solar cells convert only a small fraction of the _____ energy to useful _____ energy, the rest is converted to _____.