genesis school-gen | STEM PLD
presented by
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Solar Energy

Summary:

This resource supports your teaching around the topic of **renewable energy** and **solar power.** It contains an activity suitable for Years 5+.

Your students will:

- **UNDERSTAND:** Renewable energy is important for sustainability. Solar power is part of New Zealand's journey towards sustainable clean energy.
- **KNOW:** Solar power means using energy from the Sun to produce electricity. We use solar panels to do this. Solar panels transform solar light energy into electricity.
- **DO:** Play a catching game that demonstrates the principle of how a solar panel works.

Curriculum Links:

Learning Areas	Achievement Objectives	Levels	Years
Science **Physical World:** Physical Inquiry and Physics concepts	Explore, describe, and represent patterns and trends for everyday examples of physical phenomena, such as movement, forces, electricity and magnetism, light, sound, waves, and heat.	3–4	5+
Material World: Structure of matter	Begin to develop an understanding of the particle nature of matter and use this to explain observed changes.	4	5+
Planet Earth and Beyond: Astronomical Systems	Investigate the components of the solar system, developing an appreciation of the distances between them.	3–4	5+
Technology **Technological Knowledge:** Technological Products	Understand the relationship between the materials used and their performance properties in technological products.	3	5+
	Understand that materials can be formed, manipulated and/or transformed to enhance the fitness for purpose of a technological product.	4	5+

Understand

Earth's resources can be harnessed to use as sources of renewable energy. Solar energy is a renewable resource, because we are not going to run out of it. The Sun (**te Rā**) is important for so many aspects of our lives, and the Sun acts as an energy source which sustains all life on Earth. The Sun is important for things like growing crops, daylight and timekeeping, influencing the weather and the seasons, and of course as a source of renewable energy to make electricity.

By learning about this process, students can start to understand the functions of solar panel technology that they might see in their everyday lives.

Hurihia to aroaro ki te rā, tukuna to ātārangi ki muri i a koe—Turn your face to the Sun and the shadows fall behind you.

Know

How do solar panels work?

The Sun produces energy from radiation, which includes visible light—or what we call 'daylight.' Daylight is essential for life on Earth. Solar panels are designed to absorb the energy from the Sun, so they must be made from a material that can do this, like silicon. We call these types of materials 'semiconductors'. Solar panels can't be made out of materials that don't conduct electricity, like glass or rubber.

When a particle of light hits a solar panel, some of the energy is absorbed by the material. The energy from the light is transferred to negatively-charged particles in the material called electrons, which vibrate or move around. This starts an electric current flowing through the solar panel material. The current starts off as a DC current, which flows into an inverter to convert it to AC current. AC is the type of current that we use to power our homes.

If your students have already started learning about the particle nature of matter (Level 4), they may be able to think about the particles involved in this situation. If your students have not yet started learning about this subject, they may just want to know that "solar panels change sunlight into electricity", and that this means that we need to design and place solar panels to be able to do this efficiently.

Where do we find solar panels?

Solar panels are often found facing upwards towards the Sun, and placed in sunny areas without shade, such as the roof of a building, or out in an open field. Your students might like to think about anywhere they have seen solar panels before. Large-scale solar farms are currently found in areas like Taranaki, Nelson and Canterbury.

Benefits and challenges of solar panel technology

Solar panels only work during the daytime. Connecting solar panels to a battery can help to store the electricity produced, so if it is not all used in the daytime, it can be used at night or on a cloudy day.

Solar panels need to be made of a material that can conduct electricity. Solar panels also need to be tough enough to withstand weather conditions in New Zealand. Some solar panels are even designed to be used in space. The International Space Station, as well as most satellites, uses large solar panels as their main source of power.

Vocabulary:

Electron—A negatively-charged particle that helps conduct electricity.

Semiconductor—A material which can conduct electricity, but not very efficiently.

Solar Radiation—Electromagnetic energy that comes from the Sun.

Do

Play a catching game that demonstrates how **solar panels** transform the Sun's energy into electricity. This game can be done as a demonstration in front of the class, or can be done in pairs by the whole class.

Materials:

- Small net (e.g. fishing net OR bucket)
- Second net or bucket with a larger opening
- Small balls (e.g. ping pong balls, which fit inside the net)

Instructions:

1. Start with a class discussion which activates their prior knowledge—has anyone seen solar panels before? Where were they? Has anyone used a solar-powered device, such as a solar camping lantern or solar shower?
2. Ask the class—does anyone have an idea about what solar panels do and how they work? Your class might already know this, or might have some good ideas.
3. If you will run this activity as a demonstration, choose two volunteers to demonstrate. Or if this will be a whole-class activity, split the class into pairs and have each pair move into a clear space.
4. Give one person the net or bucket, and the other person some small balls. The person with the balls is now the Sun, and the person with the net is now a solar panel. Each ball represents a particle of solar energy. The Sun will throw the balls one at a time at the solar panel, and the person with the net or bucket will try to catch them. This activity demonstrates how solar panels 'catch' particles of solar energy.
5. Once all the balls have been thrown, observe how easy this was to do. If you have a larger bucket or net, have your class make a prediction about whether the larger net will make it easier or harder to catch the balls. Repeat the activity to find out.
6. To demonstrate why solar panels need to be facing the Sun to be effective, try this activity again but this time have the person holding the net be facing away from the Sun. Is it easier or harder to catch the balls this time?
7. Once the activity is complete, discuss with your class—do they think that smaller or larger surface areas for solar panels are a good idea? Why do solar panels need to be facing the Sun?

Smaller or larger solar panels?

Larger solar panels can absorb more light energy every second, so can generate more electricity. This is why solar panels are often very large. The solar panels on space stations and satellites are organized into "arrays" which are large flat surfaces containing many smaller solar panels, to maximize the amount of sunlight they catch.

In this activity, your students demonstrated this principle by using a larger net or bucket.

Solar panel positioning

Your students should have found that it was much harder to catch the balls thrown in this activity when they were not facing the person who was throwing. This demonstrates that solar panels need to be positioned facing the Sun so that they can most efficiently absorb the energy.

Extension activities

- If you have access to a small solar device, such as a solar lantern or solar radio, you can demonstrate how solar panels work in real time.
- Imagine that your school is going to start using solar energy. Ask the students to write a report or give a presentation to the class about where they would place their solar panels, and why?

Extra resources

Investigate other uses for solar energy by building a sundial with your class:
https://www.schoolgen.co.nz/for-teachers/resources/sundial-time

Work through the Schoolgen Renewable Energy Solutions worksheet with your class to help them understand the difference between renewable and non-renewable forms of energy:
https://www.schoolgen.co.nz/for-teachers/resources/renewable-energy-solutions

We hope you have enjoyed this educational STEM resource.
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