

SOLAR SCIENCE, MATHS & TECHNOLOGY UNIT PLAN

Curriculum	Science, with links to Technology, Mathematics & Statistics
Level	3 – 4, Extension to Level 5-6
Duration	Approx. 10 hours + extra for larger projects
Key Question	What is solar energy and how can we use it to create a better future for the Earth?
Assessment	<u>Pre-test & self-assessment</u> ; suggest evaluation of student activities / student projects; self-assessment; summative test etc
Key Competencies	Thinking, using language symbols and texts, participating and contributing
Values	Innovation, inquiry, curiosity, ecological sustainability
Vision	Connected, actively involved
Principles	Future focus, coherence
Achievement Objectives	<p>Explicit and implicit connections to The New Zealand Curriculum for Level 3 to 4 (ie. suit Years 7-10)</p> <p>SCIENCE: Planet Earth & Beyond Physical World Nature of Science</p> <p>MATHS / STATISTICS: Statistical Investigation</p> <p>TECHNOLOGY: Technological Knowledge</p>
Key Scientific Words	<p>absorb, transmit, reflect, energy, spectrum, visible, invisible, infra-red, UV, passive solar design, photovoltaic, PV, photosynthesis, thermal, transform, transformation, transparent, solar, electricity, renewable, non-renewable, sustainable, unsustainable</p> <p>A comprehensive, multi-level <u>Glossary</u> is provided on the Schoolgen website.</p>

LEARNING OUTCOMES

Investigate the relationship of the Earth and Sun [Resource 1, 2]

- Our sun is a star which emits vast amounts of energy into space, some of which hits planet earth.
- Earth is very small compared to the sun.
- Explore the relative sizes and separation of the sun and the earth using the scale model.
Note: The sun is much further away than the moon but appears to be about the same apparent size to the eye. Why?

What is Energy? [Resource 3, 4, 5, 6, 12]

- Energy is required for anything to happen.
- The sun is the main source of energy for our planet.
- There are many forms of energy and one can change into another (energy transformation).
- Important forms of energy include light, heat, motion, sound and electricity.

Investigate the role of solar energy for Earth [Resource 3, 4, 5]

- Sunlight is the most important source of energy for our planet.
- The sun's energy heats the planet, allows life and liquid water to exist, allows plants to make food (by photosynthesis), drives the water cycle, creates wind etc.

Investigate the Solar Spectrum [Resource 17, 18, 19, 20]

- Sunlight has visible and invisible parts.
- Visible light can be detected by our eye from red through to violet.
- Invisible light includes infra-red and ultra-violet (UV).

Investigate the science of light energy and materials [Resource 12, 13, 14, 15]

- Light can be absorbed, transmitted or reflected when it hits an object.
- Dark colours absorb solar energy readily and transform it into heat energy. Black absorbs light most strongly. **Note:** Absorb *not* "attract" (Attract implies force e.g. magnets attract)
- Light/shiny colours mainly reflect solar energy.
- Transparent (clear) materials transmit light.

Investigate ways to harness the sun's energy [Resource 12-19, 24]

- Sunlight (radiant energy) can be transformed into heat energy, and in special cases – electrical energy.
- Solar energy is renewable energy and can be used in two main ways with technology – for various types of heating, or for making electricity.
- There are two very different common kinds of solar panels – one heats water (thermal panels), the other generates electricity (photovoltaic panels).

Solar Heating [Resource 12-19]

- Sunlight (radiant energy) can be transformed into heat energy.
- Solar panels that heat water are called solar hot water panels.
- Solar ovens can be used to cook food and pasteurise water.
- Buildings should use passive solar design to reduce their long term costs and reduce environmental impacts.

Solar Electricity (photovoltaic) [Resource 3-12, 24]

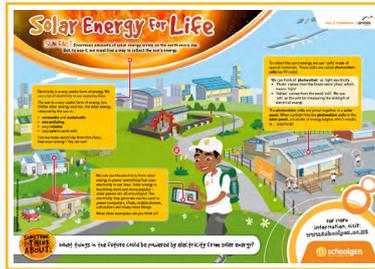
- Solar panels that make electricity are called photo-voltaic panels or 'PV' for short.
- PV panels are made of many PV cells connected together.
- Research the history of PV cells.
- Explore energy transformations with PV cells using the PV circuit kits.
- Look for patterns and trends in the school solar data.

RESOURCES FOR TEACHING & LEARNING

(Activities, projects, factsheets, teacher guides, solar data)

Activities & Projects

1. [Sun-earth scale model](#) from NASA (colour print and laminate a class set).
2. Sun-Earth size and distance [activity outline](#) on Schoolgen website [here](#).
3. [Solar Energy for Life](#) poster (Level 3-4):
4. Solar Energy for Life [teacher guide](#) (poster focus – discussion and questions.)

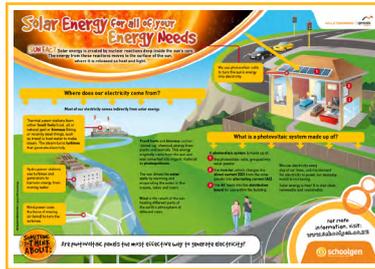


← **Print these PDFs in colour as a class set.**

There is a limited number of full colour A1 size classroom posters remaining. To receive a poster by post please email your contact details to info@schoolgen.co.nz

← info@schoolgen.co.nz

5. [Solar Energy for All of Your Energy Needs](#) poster (Level 5)
6. Solar Energy for All of Your Energy Needs [teacher guide](#) (poster focus – discussion and questions.)



7. [Real-world Solar Data](#) from Schoolgen school solar panels.
8. [Graphing My Schools PV Generation Data with Excel](#) activity – using real world data to develop graphing and data processing skills.
9. [A Short History of PV – Student Inquiry](#).
10. [A Short History of PV factsheet](#)
11. [Solar FAQs webpage](#) – comprehensive answers to Frequently Asked Questions about solar on the Schoolgen website.
12. [Exploring Energy: Build your own energy Transformer!](#) Links to mainly easy to build 'toys' that run using a range of energy sources and do a range of energy transformations.
13. [What's Cooking with Solar?](#)
14. [What's Cooking with Solar?](#) (Level 5-6 version)
15. ["Solar Oven Challenge"](#) (originally designed as a competition for Primary Science Week, 2013 – modify as required).
16. [Designing an Energy Efficient House](#)
17. [Energy Efficient House Factsheet](#)
18. [Exploring Passive Solar energy and our Classroom](#)
19. Use the Schoolgen Mean Green House Competition as the format for a class-wide project on using solar energy efficiently in architecture and select the best projects to enter (details at www.schoolgen.co.nz).

Recommended Resources

20. Solar Eclipse Shades glasses (safe for looking at the sun). Order online [here](#).
21. Rainbow diffraction glasses (NOT for looking at the sun!). Order online [here](#).
22. UV sensitive beads. Order online [here](#).
23. Infrared (non-contact) thermometers. Order [here](#).
24. PV circuit kits – Adjustable PV solar panel with connectors to electric fan, music player and light bulb to investigate the parts of a PV solar panel and the energy transformations from solar (radiant) energy to electrical energy to either kinetic (motion)/ sound/light/heat energy. Order online [here](#).