

# Solar Power

Grade

5

Topic: Energy

Grade: 5

Duration: 45 minutes (ongoing over the course of 4 hours on a sunny day)

*Students will create a solar panel to discover how the sun can be used as a form of energy.*

## **Curriculum Expectations**

- 5s54: Demonstrate an understanding of the importance of conservation of energy in relation to the wise use of renewable and non-renewable energy sources
- 5s55: Design and construct devices that use a form of energy to meet a specific need or want, and investigate how the energy is transferred to a specified output
- 5s57: Distinguish between a renewable and a non-renewable source of energy
- 5s58: Investigate ways energy can be stored for later use
- 5s67: Design devices that can transform one form of energy into another
- 5s68: List various sources of energy and identify them as renewable or non-renewable
- 5s69: Describe the advantages and disadvantages of using renewable energy sources as opposed to non-renewable sources
- 5e3: Organize information to convey a central idea, using well-developed paragraphs that focus on a main idea and give some relevant supporting details
- 5e5: Produce pieces of writing using a variety of forms (e.g., stories, poems, reports), narrative techniques (e.g., first- and third-person points of view, dialogue), and materials from other media (e.g., illustrations)
- 5e46: Ask and answer questions on a variety of topics to acquire and clarify information
- 5m114: Display data on graphs (e.g., line graphs, bar graphs, pictographs, and circle graphs) by hand and by using computer applications

## **Background Information**

Energy is the ability to produce heat or motion. It is what we use to heat and cool our homes and school, run our cars and other types of machines. There are many different sources of energy. These can be classified into either renewable or non-renewable. Non-renewable sources of energy cannot be recovered and used again. These are often called fossil fuels and include coal, natural gas and oil. These are all carbon based and the burning of these fuels is a major contributor to air pollution, the creation of acid rain and the greenhouse effect. Natural gas is the cleanest of the fossil fuels and is the major source of energy for heating homes in Canada.

All organisms are dependent on energy for survival. Life on our planet is a continuous exchange of energies among living things and the environment. Over the years, the western world has relied heavily on non-renewable energy sources such as oil, coal, natural gas and uranium. The supply of them buried in the earth is limited and we are using them up quickly. Renewable energy resources such as solar energy, wind energy, water stored behind dams, geothermal energy and biomass fuels are becoming more attractive. Alternate forms of energy are now more available and are seen as viable approaches for sources of energy. Solar, water and wind energy do not send pollutants

into the air as happens with coal, chemical and gasoline energy. Energy conservation is of prime concern to the future of this planet.

Energy resources can take several forms:

- Biomass - energy from waste products
- Chemical - energy from chemicals
- Coal - one of the most popular forms of fuel in the 1800s
- Electricity - present most places in the modern world
- Food - the food you eat provides energy for your body
- Gas - a resource that is a cleaner fossil fuel
- Geothermal - energy from the earth
- Hydroelectric - using water to generate energy
- Nuclear fission – energy produced by splitting atoms (uranium or plutonium)
- Nuclear fusion – energy produced by joining atoms
- Oil - a fossil fuel with a limited supply
- Solar power - the sun as a source of energy
- Tidal energy - the use of the ocean tides for energy
- Wind power - uses the wind to generate energy

Renewable sources of energy are constant and natural and include the sun, water and wind. These forms of energy will not run out and are much more environmentally friendly. The sun is a source of renewable energy. It is a source that cannot be depleted by humans. Solar energy is given off by the sun through its rays. This energy can be captured from the sun's rays in solar panels and used to provide hot water, create light and heat buildings. Other kinds of solar panels capture solar energy and turn it into electrical energy that can be stored in batteries so that it can be used even if the sun is not shining. Solar collectors capture the sun's energy to be used to power cars, run factories and heat and cool buildings. Solar power can be either active (solar panels to produce electricity) or passive (using more glass in buildings to trap the sun's heat). It has great potential.

### ***Accountability***

Students will appreciate the benefits of using renewable energy sources wherever possible.

### ***Teacher Notes***

1. Use this scenario approach:  
Your class has decided that they want to develop a way to reduce the energy costs at the school. You decide that you will investigate how solar energy could be used in part of the school to heat water.
2. Brainstorm the terms "renewable" and "non-renewable" sources of energy.
3. Make a class list to indicate these different energy sources. On the list, indicate how many homes in the class use the different forms of energy.
4. Discuss how solar power can be used as a source of energy. Ask students to think of locations where they have seen solar energy at use.
5. Invite an engineer, member of a conservation organization, or homebuilder into the class to discuss solar energy. Find out how common this form of energy is in your area.
6. Examine the difference in cost for using solar energy compared to fossil fuels.
7. Create a solar panel to demonstrate the principles of solar energy.
8. Display the solar panel and include a report on the use of solar energy in your community.

### ***Home Extension***

1. Find out if solar energy is used in any homes in the school community.
2. Look at the cost of heating homes over a period of time. Have them look at the differences over the course of a year.

### **Make Your Own Solar Panel**

A solar panel in a house is a large, shallow box sitting on the roof. The bottom of the box is metal, painted black. Black absorbs the sun's rays better than other colours. The box is covered with glass. Pipes run through the box, between the metal and the glass. Water flows through the pipes. As the sun shines on the box, it heats up inside. The water flowing through the pipes heats up, too. It continues on through more pipes into the house. This creates hot water for the house.

### ***Materials***

- 2 plastic dishpans, the same size
- A black plastic garbage bag
- Heavy tape or twine
- A big bucket of water, or a hose connected to a water source
- 2 thermometers
- Paper and a pencil
- A pane of glass or clear plastic, large enough to cover the dishpan
- A bright, sunny day

### ***Method***

1. Put the 2 dishpans outside on a sunny place at around 10 am. Put the black garbage bag inside one dishpan so that it covers the bottom and sides. Use heavy tape or twine to hold it firmly in place.
2. Fill the dishpans with cold water. If you have to carry the water in a bucket, ask for adult help.
3. Use the thermometer to measure the temperature of the water in the dishpans. Record these.
4. Lay the pane of glass or plastic on the dishpan with the garbage bag in it. If you are using a pane of glass, get help from your teacher. The dishpan with the pane and garbage bag is the solar panel.
5. Once an hour, for the next 4 hours, measure the air temperature. Then measure the temperature in each dishpan. Record the results.

### ***Observations***

1. What do you find with the temperatures?
2. What is the reason for having a second dishpan not made into a solar panel?
3. How does this experiment demonstrate the power of the sun?

### ***Lesson Comments***

Teachers, feel free to add in your own comments for this lesson.