Pre-activity Resources

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Introduction

Thank you for booking to attend The Solar Power Challenge Workshop. This pre-workshop material has been designed to help to familiarise your class with some of the activities and themes they will encounter during the workshop and therefore enhance their enjoyment and understanding. These activities are optional and there may be alternatives that could be used as preparation.

The Solar Power Challenge Workshop consists of two differentiated activities. For the first challenge, pupils in years 3 and 4 are asked to design and build a spinning fairground ride that is powered by solar power. The most successful teams are those that can build a spinner that carries the most people and spins the most times in 30 seconds.

Pupils in years 5 and 6 are presented with the solar power winch challenge. The pupils are required to design and build a winch that can vertically lift a weight. The winch must be solar powered and successful teams are those that can lift the heaviest weight in the quickest time.

The Solar Power Challenge Workshop and these pre- and post-workshop materials cover the following aspects of the Key Stage 2 curriculum.

Independence and interdependence of organisms:

- How humans affect the local environment

The sustainable Earth:

- The relative positions and key features of the Sun and planets in the solar system
- A comparison of the features and properties of some natural and man-made materials

Post-workshop Materials

These contain an outline of the workshop, including suggested follow-up activities to help clarify your pupils' understanding. The activities specifically relate to the themes and ideas presented in The Solar Power Challenge Workshop.

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Acknowledgements

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Types of Energy

What is meant by the term “fossil fuels”?

Give an example of a renewable energy source.

Why do we need to find renewable sources of energy?

Exercise

In the UK, almost all of our electricity is produced from burning fossil fuels. The table below shows how our electricity is produced. Using the grid put this information into a graph.

Include the following on your graph:

- A title
- Labels for the axis
- Numbers along one axis
- Categories along one axis
- Coloured bars

Types of Energy	% of UK’s supply
Coal	30
Gas	29
Nuclear	15
Oil	13
Other (e.g. biomass)	10
Renewable energy	3

Renewable Energy

- Photocopy this page and cut out each of the squares.
- Match the type of renewable energy to its picture.
- Match the type of renewable energy to its description.

Biomass Energy	Wind Energy	Solar Energy
Hydro-electric Energy	Wave Energy	Tidal Energy






Power from the wind	Power from the Sun	Power from the wind
Power from tides	Power from water	Power from plant and animal waste

The Sun

Solar power comes from the Sun. But what is the Sun?

The Sun is actually a star that gives out heat and light. It is roughly spherical in shape and is about a million times bigger than the Earth. There are eight planets that move around (or orbit) the Sun. The planets and the Sun make up the solar system. Try this activity for making your own scale model of the solar system.

What you need:

- A ball with diameter 20cm (e.g. a bowling ball, a beach ball)
- Two pins
- Two peppercorns
- A chestnut
- A hazelnut
- Two peanuts
- Name cards for the Sun and the planets
- Ten pupils

Look at these items. Each of these items represents an object in the solar system. Compare their sizes. How far apart do you think we need to place the items to make a scale model of the solar system?

What you do:

1. Select 9 pupils from the class. Hand each pupil a name card and the relevant item from the table below.

Object	Item	Number of paces
The Sun	Beach ball or bowling ball	0
Mercury	Pin	10
Venus	Peppercorn	9
Earth	Peppercorn	7
Mars	Pin	14
Jupiter	Chestnut	95
Saturn	Hazelnut	112
Uranus	Peanut	249
Neptune	Peanut	281

2. The pupil who is the Sun should stand against the wall.
3. Each of the “planet” pupils should walk the given number of paces away from the last object. For example, Mercury should walk 10 paces away from the Sun. Venus should walk 9 paces away from Mercury. The rest of the class should count as the pupils take their steps. The pupils are likely to be very surprised with the enormous increases in distance between the gas planets.

Think about:

- What do you notice about the sizes of the first four planets? Are they similar or different?
- What do you notice about the sizes of the last four planets? Are they similar or different?
- How do the sizes of the first four planets compare to the sizes of the second four? Are they larger or smaller?
- Using the internet or library, find out the collective names for the first four planets and for the second four planets.
- Find out why Pluto isn’t classed as a planet anymore. What is it now known as?

What is Solar Energy?

Although the Sun is 93 million miles away from the Earth, we can use its energy to provide light, heat buildings and generate electricity.

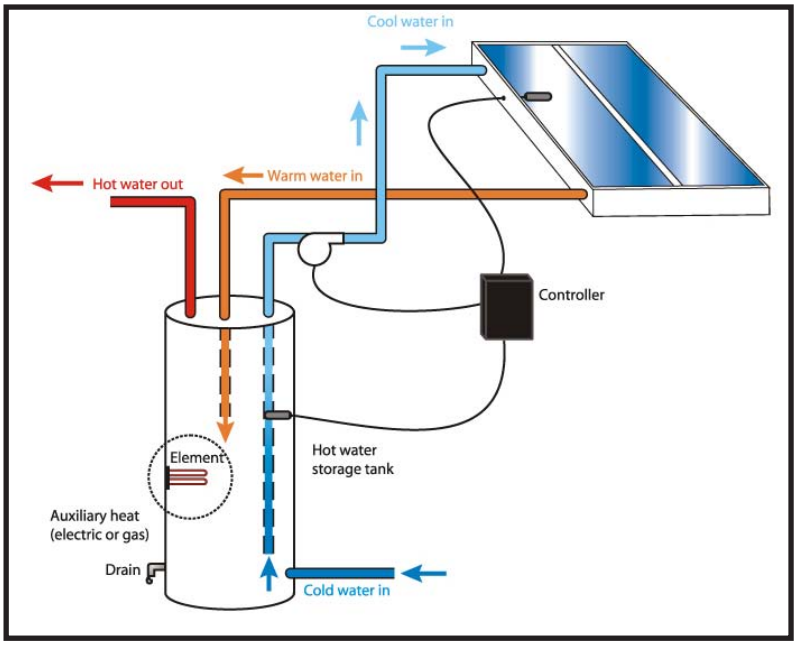
What do you think would happen to planet Earth if the Sun stopped giving out light and heat energy?

1. Passive solar designs

Buildings, such as houses, can be designed to capture the Sun's energy. They are built with large south-facing windows and have thick insulation in the walls and roof space to prevent heat loss. This means less heating and lighting are needed. Techniquest in Cardiff Bay has a long glass wall that is designed to let in lots of light and warm the building.

2. Active solar designs

Water is pumped through pipe work that is painted black. The black pipes absorb the Sun's energy and the water is warmed as it flows through. The heated water can then be stored in tanks, where it is transported throughout the building for washing and heating.



3. Photovoltaic (PV) cells

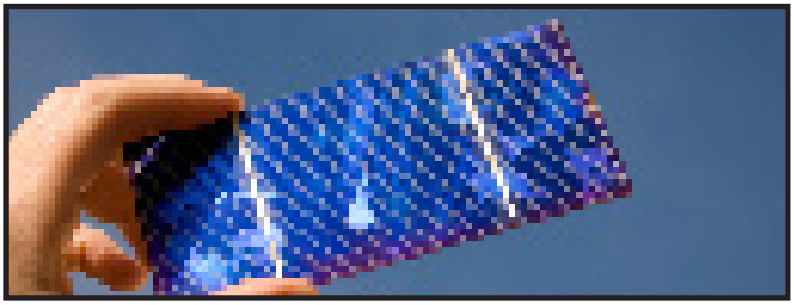
PV cells change light from the Sun into electricity. You can see PV cells on your school calculators. You can also see large PV attached to the roofs of houses. These PV cells are used to transfer the Sun's energy into electricity, which then powers the lights and electrical equipment in the house. You can see PV cells on many solar power gadgets.

Give three advantages of using solar energy instead of fossil fuels:

1.

2.

3.



Things you can try yourself:

Use a solar powered calculator to find out how different conditions affect the energy produced by PV cells.

In which of these places can you use a solar powered calculator?

- Indoors under a table
- Indoors by a window
- Outside in the shade
- Outside in full sun

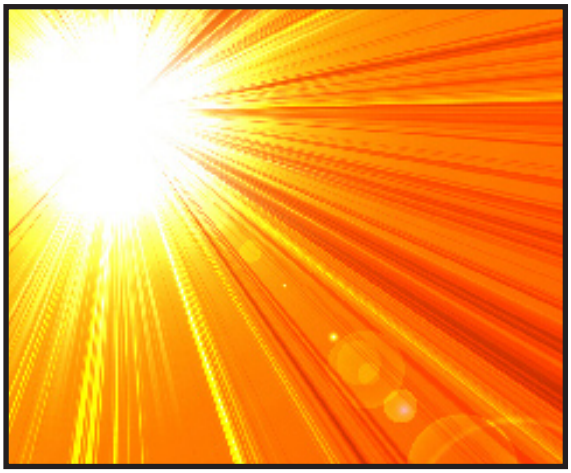
What do your findings show about how PV cells work?

Light and Colour

It was a hot summer day and Heulwen was playing in the park with her two friends. They were having great fun playing on the slide and the swings and spinning on the roundabout. The three friends were all very thirsty after playing all afternoon and raced over to their bags to get a drink of water. Their bags had all been lying next to each other in the sunshine all afternoon.

Heulwen's bag was light pink and her bottle of water was quite warm when she drank from it. Megan's bag was bright blue and her drink was also quite warm when she drank from it. Dafydd's bag was black and his drink was very warm.

"Why is my drink warmer than yours?" Dafydd asked the two girls. "All of our bags have been in the sun for the same amount of time and all our drinks were cold when we started playing." Heulwen and Megan thought about this and tried to find the answer.



Exercise

To explore this, the three friends set up an experiment. They wrapped coloured card around six empty food tins. One tin was covered in black card, one white, one blue, one pink, one red and one yellow. They filled the food tins with the same amount of water and cut six circles of coloured card and placed them over the matching tins.

Heulwen measured and recorded the temperatures of the water in each of the six tins. She then placed the tins on a windowsill in full sunlight. After two hours, she measured the temperature in each of the tins again.

Predict which tin will have the warmest water after being in direct sunlight for two hours.

Predict which tin will have the coolest water after being in direct sunlight for two hours.

Why have you predicted these results?

Predict which tin will have the warmest water after being in direct sunlight for four hours.

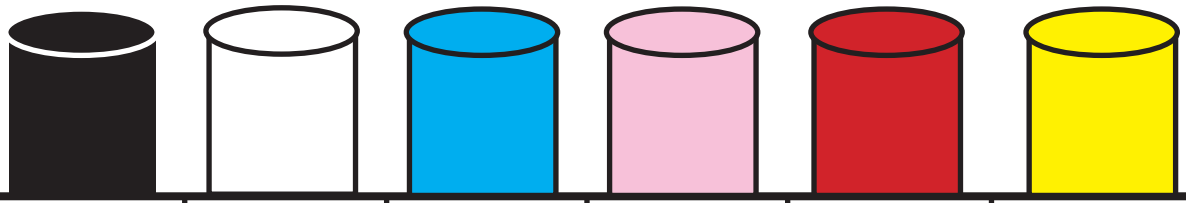
Carry out this experiment to test your predictions.

- Six empty food tins all the same size
- Coloured card – black, white, blue, pink, red, yellow
- Sellotape or glue
- Scissors
- Pencil
- Water
- Thermometer

What you do:

1. Cover the sides of each of the six tins in a different coloured piece of card
2. Cut a circle out of each piece of coloured card slightly larger than the top of the tin
3. Add 150ml of water to each tin
4. Place the correct circle of card over the mouth of each tin
5. Stand the tins overnight
6. Record the start temperature of the tins
7. Place all of the tins on a windowsill in full sunlight
8. Measure the temperature of the water in each of the tins after two hours

Record your results below:



Start Temp						
Temp after 2hrs						

Give two ways in which Heulwen made sure this is a fair test.

_____

_____

Complete these sentences:

I have looked at my results and found that…

_____

Circle the correct statement:

This is what I predicted **This is not what I predicted**

My explanation for this is…

_____

I think my investigation could be improved by…

_____

I-Spy Solar Powered Gadgets

Which of these solar powered gadgets have you seen? **What other solar powered gadgets have you seen or used?**

Solar road sign...

Solar heating system...

Solar street light...

Solar temporary traffic lights...

Solar powered water fountain...

Solar garden lights...