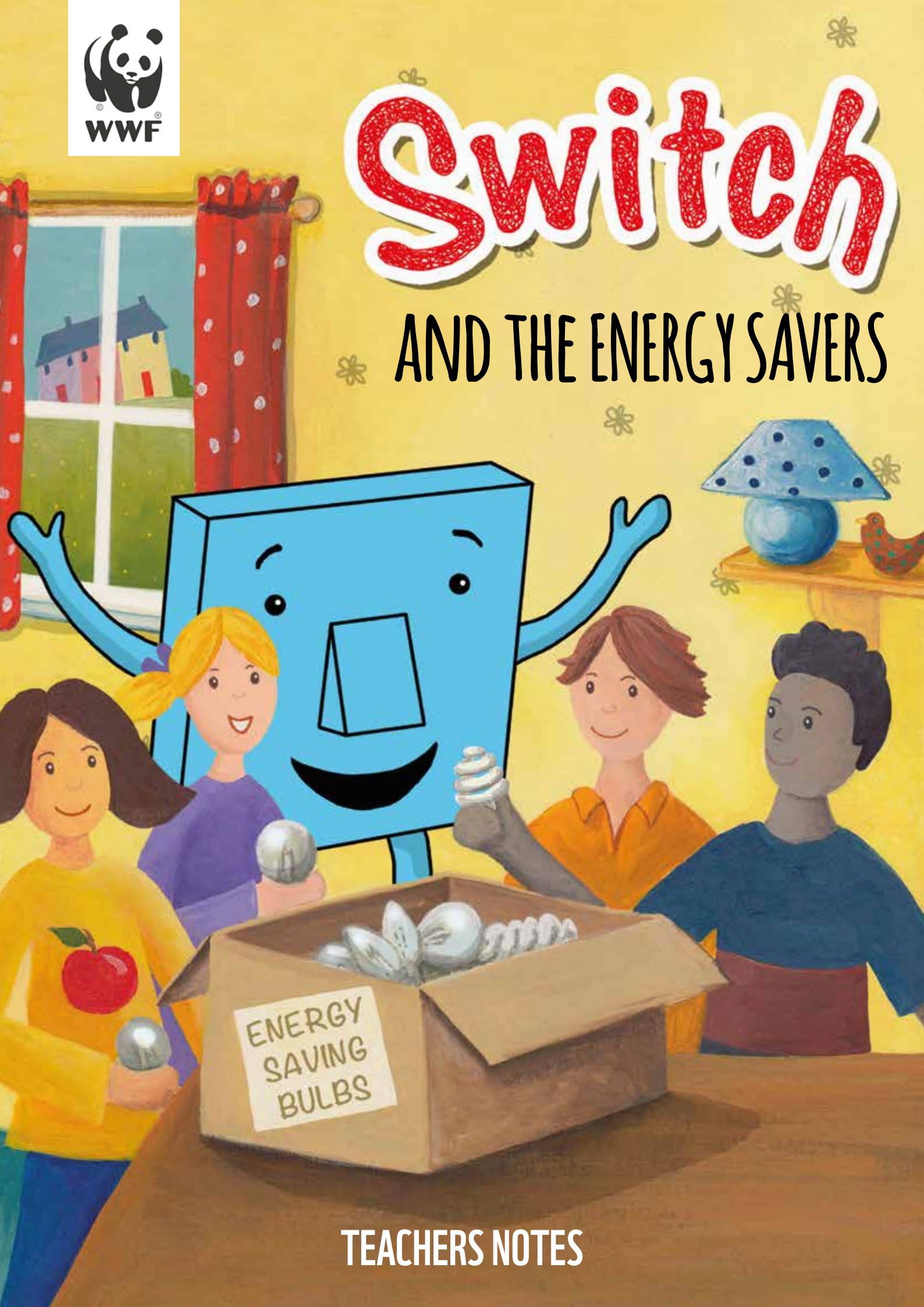
WWF

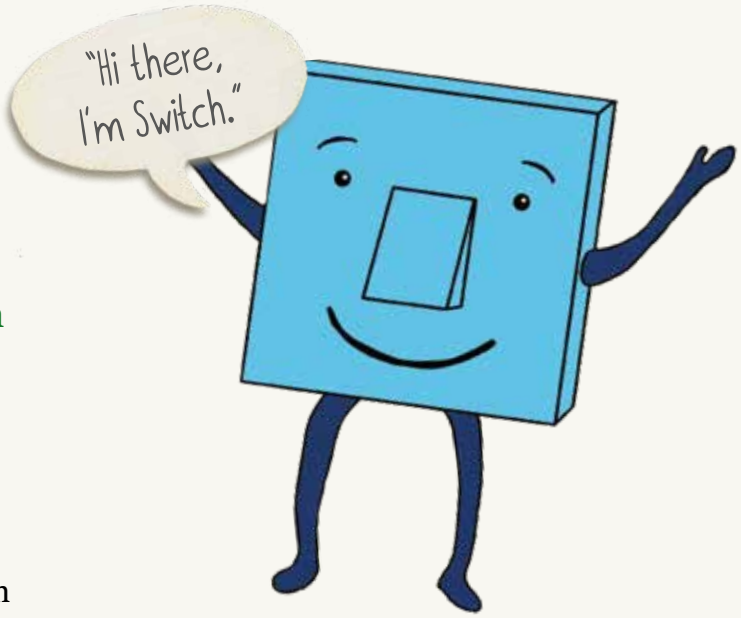
Switch

AND THE ENERGY SAVERS



TEACHERS NOTES

INTRODUCTION



We hope you and your pupils enjoy WWF's 'Green Ambassador' storybook "Switch and the energy savers". This storybook is designed to introduce 5-7 year olds to key environmental ideas in a fun and accessible way, with Switch and the other Green Ambassador characters to help.

WWF's Green Ambassadors scheme aims to put young people at the heart and in the lead of caring for nature in their schools. As 'Green Ambassadors', pupils are representatives on behalf of the planet within their school and community, and equipped with relevant knowledge and skills, they inspire and motivate others to do their bit by acting as environmental citizens.

The storybook is designed for group reading sessions led by the teacher or TA – and is intended to link to curriculum topics relevant to 5-7 year olds. There are examples of activities for school and home at the end of this book, as well as a new vocabulary list.

On the following pages, you will find useful background information about the ideas introduced in the storybook to help you incorporate them into your lesson planning and to answer pupils' questions.

We hope the story and the discussions it could lead to will support your work in the classroom and lay the foundations for developing an understanding about how our choices and our actions around energy affect our lives and the planet.

If you have any feedback that could help us improve this storybook and the related resources, please email us at: greenambassadors@wwf.org.uk

ABOUT THIS STORYBOOK

This storybook aims to introduce 5-7 year olds to issues of energy use and its environmental impact. Pupils meet the Green Ambassador character Switch, who is a fast-talking expert on technology and all things energy. Switch takes care of others, is happy to be a leader, and always has a plan.

Switch is neither a boy nor a girl, male or female. Switch is just Switch – and the same goes for the other Green Ambassador characters too.

"Switch and the Energy Savers" is about our use of energy – to power our homes, our schools, our vehicles and devices. We take energy for granted, we flip a switch and the lights come on, but where does that energy come from and what impact does creating and using that energy have on our environment and the planet that we all depend on? Our story aims to introduce children to the idea that energy is not unlimited, that wasting it is not good to do, and that how energy is produced has a big impact on our environment.

The story starts when our Green Ambassador character Earth starts feeling unwell. Switch tells the four children in the story that people are using too much energy and that is causing Earth's high temperature. The story does not explore how the energy is made, though we see the smoke from power stations and the exhaust fumes from cars. The children in our story want to help Earth and decide to try to

reduce the energy being used in their school and in their homes.

The children's initial efforts don't make much of a difference – saving energy isn't as easy as they thought it would be. They switch off the lights in the empty classrooms at school, but the next day all the lights are on again. At home, their first efforts are also not very successful. People need energy and it's hard and not always possible or appropriate to suddenly stop using it.

The children talk to Switch and develop their strategy. It's not just about switching lights off once, they realise, it's about changing people's behaviour and about being smart about energy use. They learn from Switch about energy saving lightbulbs and they hold an assembly to make the whole school aware of the need to save energy.

Then they work to make sure all the lights at home and school are energy efficient ones and put up notices to remind people to turn lights off when rooms are empty. And they take the same messages to another school in the area where they see all the lights are being left on. With their help, Earth feels a little bit better.

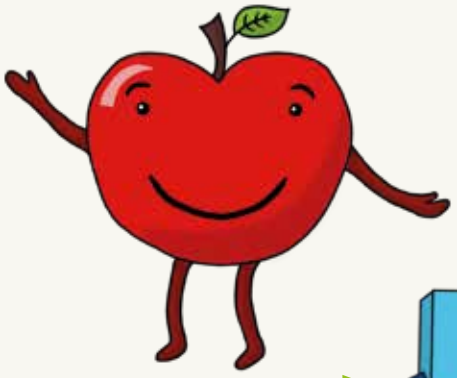
Our story aims to explore the real difference children can make to energy use in their lives, and to open the way for classroom discussions of where energy comes from, energy efficiency and the environmental impact of different ways of producing and using energy.

ABOUT THE GREEN AMBASSADORS

Each Green Ambassador character represents a different environmental theme:

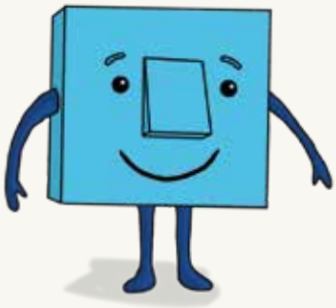
SMITH

is mad about food, where it comes from, which foods are healthy and which are not, and about the impact that producing food has on the environment and the planet.



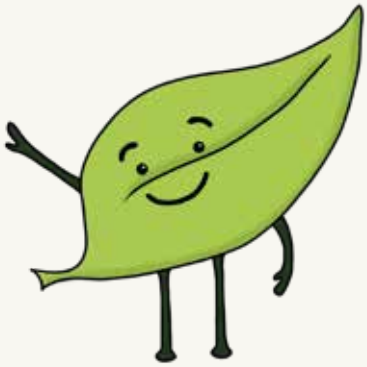
SWITCH

is energised about energy, how it is produced, the impact it has on the planet, and things we can all do to be more aware about the energy we use.



LEAFY

is wild about living things. Leafy has a cameo in Smith's story, advising the children on the different vegetables and fruit that grow in the different seasons.



CRUSH

is crazy about recycling. Crush hates waste – why throw something away when it can be used again?

WHEEL

is spinning about how we get around. Wheel would prefer you to walk, run, cycle or skate rather than get into a car – it's good for you and good for the planet.

TAP

gushes about water use. Tap teaches us how precious water is, and the great effort needed to make clean water and the simple ways to avoid wasting it.

To find out more about the Green Ambassador characters please visit WWF's dedicated schools website – here www.wwf.org.uk/gacoreresources.

There's also a short film featuring the Green Ambassador characters that you can show your pupils – watch it at www.wwf.org.uk/gafilm.

KEY IDEAS IN THE STORY

While climate change is hugely complex and an issue facing the whole world, there are simple things we can do to make a difference. We all use and rely on energy – and this is one area where our actions can make a real difference. Pupils who are Green Ambassadors are in a great position to encourage those around them to be aware of the energy they use, to understand where energy comes from, to avoid wasting it and to use energy efficient devices. We hope that this story and the key messages it contains will give them the knowledge, motivation and enthusiasm to start spreading those messages.

1. BE ENERGY AWARE – the energy we use has an impact on our world

The human world relies on abundant energy and in developed countries we are so accustomed to having the energy we need that we often take it for granted. Turn a switch and a light comes on. Put the key in the ignition and the car starts. But all the energy we use comes from somewhere – and the way that it is produced and the amount we use are critical drivers of climate change, despite advances in renewable sources of energy such as solar and wind power.

Our story doesn't explore how energy is produced, but is designed to complement classroom learning on related topics. The starting point of the story is to be aware of energy use and to avoid wasting it – as energy use can have an impact on the environment and the planet.

PROMPT QUESTIONS FOR PUPILS:

- **How can you tell if a When do you and your family use energy in your everyday lives? [Examples might include lighting rooms, cooking food, keeping us warm]**
- **What things in your house use energy? [Examples could include the fridge, cooker, washing machine, TV]**
- **What do we call the kind of energy that powers our lights, laptops, tablets, vens etc? (Do you know where it comes from?)**

2. There are things we can all do to SAVE ENERGY – every little bit counts

Every time we flip a switch we are using energy (electricity). Every device we plug in to a socket also draws energy – whether it's a TV, a phone, a washing machine or an electric cooker. Imagine adding up all the light bulbs you see in your daily life and all the devices plugged into sockets. All of them are using electricity when they are turned on. Imagine that the same is true in all the homes and buildings that you see – and all of these around the country and across the world. People use a lot of energy every day.

PROMPT QUESTIONS FOR PUPILS:

- **How many light bulbs are there in this classroom? Can you estimate how many there are in the whole school?**
- **How many devices are plugged in to sockets in your home?**
- **Do you ever come into an empty room and find the lights on? At school? At home?**
- **Does turning one light off make a difference?**

3. Where possible USE ENERGY EFFICIENT DEVICES

As well as turning devices off when we are not using them, we can save energy by using devices that do the same thing but use less energy to do it. The energy saving / low energy bulbs featured in our story are one example.

Low energy bulbs typically use between 25% and 80% less electricity than incandescent and halogen bulbs while producing the same amount of light. They often look different from 'traditional' bulbs and produce significantly less heat when they are on.

PROMPT QUESTIONS FOR PUPILS:

- **Do you use low energy bulbs at home?**
- **Are there any here at school?**
- **How can you tell the difference between a low energy bulb and an 'ordinary 'one?**

4. We can make a difference if we CHANGE OUR ENERGY HABITS

It is a good idea to turn lights and devices off when they are not being used – but it can be hard to remember to do it if we aren't in the habit of doing so. And even if we change what we do, other people might still leave devices on.

PROMPT QUESTIONS FOR PUPILS:

- **When would it make sense to switch off lights?**
- **Do you switch off lights when they aren't needed?**
- **How could you remember to turn things off when you are not using them?**

5. We can make a difference if we tell others and SPREAD THE MESSAGE

It is not enough for us to change our own energy habits if we want to make a real difference. We need to work with other people so we all change our habits.

PROMPT QUESTIONS FOR PUPILS:

- **Are people good at saving energy in our school – do you often see lights and devices on when they are not being used?**
- **What about at home?**
- **How could you help other people to remember to turn devices off?**
- **How could you help other people to use energy saving devices?**

ACTIVITY - SCHOOL ENERGY USE SURVEY

In this activity, pupils will find out about how energy is being wasted – and how it can be saved – at school.

KEY VOCABULARY

Device, electricity, energy, light bulb, planet, power, saving, switch, wasting.

LEARNING OUTCOMES

Pupils will develop their speaking and listening skills; they will learn about energy use in school.

PREPARING FOR THE ACTIVITY

You will need to have some pictures of power stations and electrical pylons, as well as pictures of renewable energy sources like solar panels and wind turbines. Bring a selection of different kinds of light bulbs so that pupils can see the difference between ordinary ones and low energy ones.

WHAT TO DO

1. Talking about energy and how we use it

Start by talking about the lights in the classroom and ask pupils what powers them. Have they ever experienced a power cut? Ask them what other devices use energy – make a list of all their suggestions, help them to think of ones they haven't thought of.

2. Surveying devices and lights in the classroom

Ask the class to look around the classroom and count the number of different things that use energy – lights, computers, electronic whiteboards, etc. (If they mention heating radiators, you can mention the use of gas and other fuels for central heating). Ask the class if they notice when lights get left on in empty rooms? Do they think it matters if they are left on? Talk about electrical safety, why they need to get grown-ups to help when using devices and power sockets.

3. Where energy comes from - and why how it is made matters

Talk about how electricity is generated – show pictures of power stations and the pylons that carry the power to the cities. Talk about what the power stations use to make the energy – coal, oil and gas. Use the background information (which begins on page xx) to explain in very simple terms what happens when these fossil fuels are burnt and how the gasses they emit are changing the temperature of the planet and the weather we experience. Ask for their ideas of how these changes to the climate could affect people. Show the pictures of the solar panels and the wind farms and talk about renewable energy – energy that does not run out and that does not cause climate change. Discuss why electricity made in these ways is better for the environment than electricity made in a 'traditional' power station.

4. How can we save energy?

If using energy made in power stations is affecting the planet, how can we reduce the energy we use? What could *people at the school* do to reduce the energy they use? Gather as many ideas as possible, before focusing on what could be done at school and in their homes. Show the children the energy saving light bulbs. Ask them how many of them use them at home. Also discuss 'standby mode' – the red light on devices which may mean they are still drawing energy.

5. School energy use - initial survey

The idea is to carry out a survey of the school to firstly find out if low energy bulbs are being used. If not many are being used you could develop an activity to work out how much energy could be saved if energy saving bulbs were being used. You will need to make arrangements and plan for groups of pupils to visit different classrooms and other parts of the school in break or at other times. The

second aspect of the survey is to find out if lights and devices are being left on in rooms when they are not being used – at break times for instance. You can use or adapt the survey form below. If it is too ambitious to carry out a school-wide survey, you could reduce the survey to focus on one or more classrooms.

6. Changing energy habits – through displays, signs and an assembly

Pupils could work together to make a display on energy use and energy saving – or create an information poster that could be copied and used in every classroom. The children could also create small signs or notices that could be used all around the school to remind people to switch off lights and devices when they are not being used. The class could also hold an assembly to spread the word to the whole school.

7. School energy use – follow up survey

The follow up survey is designed to see if the children's 'campaign' (made up of the assembly, the displays and posters) has managed to change people's behaviour on energy use and made a measurable difference. Has the number of lights left on changed? Are more low energy bulbs being used? (To develop the scope of the activity, you could ask the school office for details of the school's average energy use before and after the campaign to see if there's a significant difference. A celebration could be held to recognise the effort made and the energy and money saved).

SCHOOL ENERGY USE – INITIAL SURVEY, PART 1

ROOM	NUMBER OF LIGHTS	LOW ENERGY BULBS	NUMBER OF DEVICES
OUR CLASSROOM			
SCHOOL OFFICE			
HEADTEACHER'S OFFICE			
DINING ROOM			
ETC...			

SCHOOL ENERGY USE – INITIAL SURVEY, PART 2

EMPTY ROOM	DATE AND TIME OF CHECK 1	NUMBER OF LIGHTS AND DEVICES LEFT ON	DATE AND TIME OF CHECK 2	NUMBER OF LIGHTS AND DEVICES LEFT ON	DATE AND TIME OF CHECK 3	NUMBER OF LIGHTS AND DEVICES LEFT ON
OUR CLASSROOM	Break Monday	2	Break Wednesday	2		
OUR CLASSROOM						
HEADTEACHER'S OFFICE						
OUR CLASSROOM						

SCHOOL ENERGY USE – FOLLOW-UP SURVEY

EMPTY ROOM	DATE AND TIME OF CHECK 1	NUMBER OF LIGHTS AND DEVICES LEFT ON	DATE AND TIME OF CHECK 2	NUMBER OF LIGHTS AND DEVICES LEFT ON	DATE AND TIME OF CHECK 3	NUMBER OF LIGHTS AND DEVICES LEFT ON
OUR CLASSROOM	Break Monday	2	Break Wednesday	2		
OUR CLASSROOM						
HEADTEACHER'S OFFICE						
OUR CLASSROOM						

BACKGROUND INFORMATION FOR TEACHERS TO USE

ENERGY – A BASIC NEED, BUT AT WHAT COST?

1. Talking about energy and how we use it

Energy is what makes things happen. We use energy when we move our bodies. We use lots of energy when we do sports. Even when we are asleep we are using energy. Food is a kind of energy - we turn food into the energy our bodies need.

Electricity is another kind of energy. It runs inside wires and devices, and makes lights shine brightly, it makes fans go round, it makes the fridge cold and the

2. What do we use energy for?

We use lots of energy in everyday life. We use energy at home to make the lights shine, to heat our food, to warm our houses, to make our machines work – the washing machine, the tumble dryer, and the television. We use energy to charge up devices like mobile phones, laptops and tablets.

We use energy to get to school. If we walk or ride a bike to school, we use up some of the energy in our bodies. If we take the bus, the bus uses up some of the energy from the fuel in its tanks. The same is true for cars.

Schools use lots of energy – to make lights shine, to make computers work, to heat up classrooms and offices, to cook food and make water hot. Everywhere you look, there is energy being used.

3. What are the different sources of energy?

NON-RENEWABLE SOURCES OF ENERGY

FOSSIL FUELS

There are three major forms of conventional fossil fuels: coal, oil and natural gas. All three were formed millions of years ago before the time of the dinosaurs, in a period of time called the Carboniferous Period.

During the Carboniferous Period (about 290 to 354 million years ago), the earth was covered with swamps filled with huge trees, ferns and other large leafy plants. As the trees and plants died, they sank to the bottom of the swamps forming layers of a spongy material called peat. Over many hundreds of years, the peat was covered by sand and clay and other minerals, which turned into a type of rock called sedimentary. The layers piled up on top of each other, becoming heavier and putting pressure on the peat. Under this pressure, the water in the peat was squeezed out, and eventually, over millions of years, the peat turned into coal, oil or petroleum, and natural gas.

Fossil fuels take millions of years to make. The world has limited amounts of these resources left and we are using them very quickly. The world cannot create more. Once they are gone they are gone.food and make water hot. Everywhere you look, there is energy being used.

NUCLEAR ENERGY

Another type of -renewable energy is nuclear energy which unlocks the power of the atom. When an atom's nucleus is split apart, it releases a tremendous amount of heat and light energy. When this process is controlled the energy can be used to generate electricity.

A nuclear power plant uses the element uranium as a 'fuel'. Uranium is dug out of the ground and processed into tiny pellets that are loaded into long rods and used in the power plant's reactor. Inside the reactor of a nuclear power plant, uranium atoms are split apart in a controlled chain reaction that releases heat energy in a process called nuclear fission.

Nuclear power creates radioactive wastes that can remain dangerous for up to 100,000 years and so must be contained and actively managed. Despite 60 years of nuclear power, there is still no long-term solution for storing radioactive wastes.

RENEWABLE SOURCES OF ENERGY

HYDRO-ELECTRICITY

Water can be used to make hydro-electricity. Hydro-electric power uses kinetic energy from

moving water to make electricity. This is done through turbines which generate power from the flow of a body of water. The water flow can be controlled using a dam.

SOLAR ENERGY

We can convert sunlight directly into electricity using photovoltaic (PV) cells. Many people put solar panels on their roofs to generate electricity for their home, office or schools. Other types of solar panels can be used to heat water rather than relying on a conventional gas boiler.

WIND ENERGY

The kinetic energy from the wind can be changed into mechanical or electrical energy using wind turbines. When grouped together they are called wind farms. Wind turbines can be built on land (onshore) or in the sea (offshore). The UK has more offshore wind turbines than any country in the world. They will play a big part in our future.

BIOENERGY

Bioenergy is energy derived from any recently living organisms and sources can range from things like dead trees, tree branches, wood chips, crops and food waste to sewage or manure. Bioenergy can be a useful source of electricity but it can also have negative impacts if it leads to deforestation to make way for crops .

WAVE ENERGY

The movement of the ocean can be used to power underwater turbines and generate electricity from waves. Technology to collect energy from waves is still quite new and is improving all the time. Wave energy may have a very big part to play in the future.

TIDAL ENERGY

There are two different ways of generating electricity from the tides. One is called a tidal barrage which can be built across the mouth of a river. Some people want to build a barrage across the Severn River between England and Wales but this is controversial because of the damage it may cause to wildlife and biodiversity in the area. Other types of tidal energy, like individual underwater turbines are newer and still being developed.

4. Energy and climate change

The known reserves of fossil fuel energy sources are five times what we can burn if we are to have any chance of keeping global temperature rise within 2 degrees Celsius and thus avoiding the worst effects of dangerous climate change. But there is a solution: energy sources that use the power of nature and won't run out or contribute to climate change. There's no shortage of renewable energy from the sun, wind and water and even some forms of 'waste'.

Throughout geological time, our planet has been through many changes: continents have shifted, islands have appeared and disappeared, the climate has warmed and cooled, and the ice caps melted and refrozen. Many animals and plants have evolved – and continue to evolve; many have become extinct. What is of concern to scientists today, is the extent and speed at which present day changes are happening – the climate is changing much faster than it ever has before and the vast majority of scientists believe this is caused by the activities of people.

Burning fossil fuels, such as coal, oil and gas, is one of the major contributors to climate change as it releases 'greenhouse gases' like CO_2 into the atmosphere, increasing temperatures. And climate research shows that greenhouse gas emissions are rising more rapidly than predicted.

The changes to our climate are of particular concern with the vast majority of scientists and governments agreeing that climate change poses a global threat. There is a general consensus amongst the global community that temperature rises should be kept well below 2 degrees Celsius of warming compared to pre-industrial levels. However, climate scientists project that based on the commitments that countries have made so far to reducing their emissions, levels of warming by the end of the century are more likely to be between 3.5 and 4 degrees.

EFFECTS AND IMPACTS

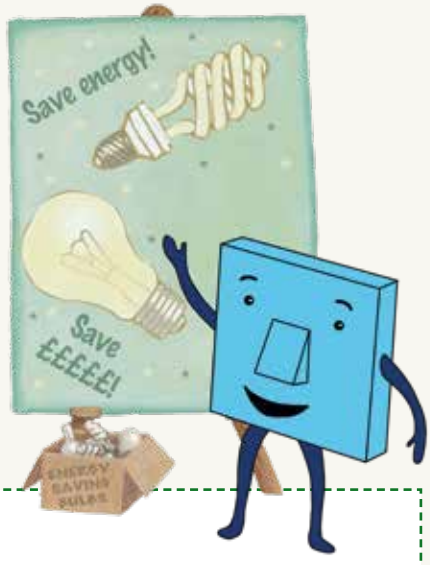
Climate change puts a large amount of pressure on the natural world – affecting wildlife, people and the places they live. Fragile ecosystems and species already at risk – because of deforestation, unsustainable farming or over-fishing – may be pushed over the edge.

- Very few species or habitats will be completely immune to climate change. Some may be adaptable, but others are very specialised in how or where they exist, which puts them at particular risk.
- Global warming is likely to be a major cause of species extinctions this century. The Intergovernmental Panel on Climate Change says a 2-3°C average temperature rise may put 20-30% of species at risk.
- Sea levels have risen about 20 cm since pre-industrial times and are now rising at 3.2 cm per decade. As temperatures and sea levels rise, people living in low lying areas will be at risk from flooding. Climate change 'refugees' could well be a common phenomenon.
- Climate change is thought to be linked to an exceptional number of extreme heat waves which have occurred over the last decade. Major food crop growing areas are increasingly affected by drought, affecting what and where people can grow crops. This poses a serious problem in a world where so many people already face hunger or starvation.

5. Energy saving light bulbs

Lighting is said to account for around 18% of the energy use of a typical household. The traditional light bulb actually hasn't changed much over the years, and varies very little from the earliest light bulbs invented more than 150 years ago. These bulbs work by heating a wire or element inside a bulb containing a special gas. They are very inefficient, converting only about 5 percent of the energy they receive into light – much of the energy is consumed as the bulbs get very hot.

Low energy bulbs use different technologies to produce light – and save a lot of energy while providing the same amount of light. Low energy bulbs can use between 25% and 80% less electricity than incandescent and halogen bulbs depending on the kind of bulb they are. They often look different from 'traditional' bulbs and produce significantly less heat when they are on. The technology is changing rapidly – early models took time to warm up and were larger than traditional incandescent bulbs. New designs are compact and light instantly. They are more expensive than traditional bulbs, but last longer and save money by using less electricity.



USEFUL LINKS

www.wwf.org.uk/what_we_do/tackling_climate_change/impacts_of_climate_change/
www.wwf.org.uk/what_we_do/tackling_climate_change/climate_change_explained/
www.create.org.uk/schools/teachers_resources.asp#downloadables
www.clean-air-kids.org.uk/globalwarming.html
www.energysavingtrust.org.uk/home-energy-efficiency/lighting

RESOURCES:

'How the Weather works' (WWF and Templar Publishing, KS2)
www.wwf.org.uk/sites/default/files/2017-02/How%20the%20weather%20works.pdf

Ashden LESS CO2 programme for school