BBC TERRIFIC SCIENTIFIC

Teacher Resource

Power: How much does my school use?

Power

Terrific Scientific Campaign

Investigation: Power

Hello! Welcome to the Power Investigation from the Terrific Scientific campaign!

At Terrific Scientific, we think it is vital to develop science learning in primary schools across the UK. By taking part in this activity, you will be developing your class's scientific thinking and investigative skills.

At Key Stage 2 (Second Level), **children need to:**

- **Develop** investigative skills.
- **Understand** when it is important to control variables.
- **Predict, observe and record** results.
- **Draw conclusions** (which may generate new questions).
- **Understand** the need to repeat activities.
- **Take** accurate measurements using standard units, using a range of equipment, including thermometers and data loggers
- **Record** what they see and not what they want to see.

We have incorporated these principles into this exciting activity. We've made it suitable for primary classrooms by using readily available equipment and suggesting opportunities for support and differentiation.

The BBC deems this activity safe if following some basic precautions. It is your responsibility as a school to carry out your own risk assessment and we recommend you consider the risks and mitigations we have described in this activity pack, as well as any risks which may be relevant to your specific class environment.

As well as these key working scientifically principles, we have made sure there are links to the science curriculum for each nation, as well as cross curricular opportunities for further learning. We think these are just as important, as they help to explain the relevance of Science and how it links to the world around us.

On our website you will find a supporting 'How to' film which shows teachers and teaching assistants how to set up and carry out the experiment. You will also find additional resources including a step-by-step lesson presentation, including an introductory film which sets the investigation into context for your students.

We originally partnered with the University of Edinburgh for this investigation.

We hope this inspires you and your students to get scientific!

The Terrific Scientific Team.

Related links:

Find out more about Terrific Scientific and our other investigations on – bbc.co.uk/terrificscientific

Supported by: The University of Edinburgh, Institute of Physics, Primary Science Quality Mark, Eco-Schools: England, Scotland, Wales and Northern Ireland

Contents

Through these activities children will:

- **Recognise** how much we rely on electricity.
- **Consider** ways in which they can reduce their power consumption.
- **Recognise** how thermal insulation has an impact on efficiency.
- **Record data** appropriately and accurately.
- **Talk about and explain** casual relationships using scientific knowledge and understanding.
- **Communicate** their findings to a wider audience.
- **Learn** how electricity is generated

Try the quiz:

Do you have the power of electricity knowledge? Test yourself with this fun quiz, but be warned, some of the answers will shock you!

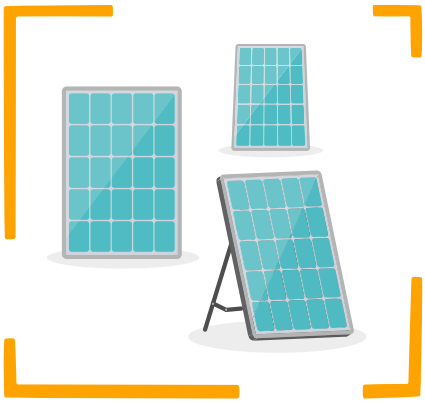
bbc.co.uk/guides/zt3bsrd

What will the children learn? (England, Scotland, Wales, Northern Ireland)

England

Working scientifically

- Taking measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repeat reading where appropriate;
- Recording data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs;
- Reporting and presenting findings from enquiries, including conclusions, casual relationships and explanations of and a degree of trust in results, in oral and written forms such as displays and other presentations;
- Identifying scientific evidence that has been used to support or refute ideas or arguments;



Materials

Y5 – compare and group together everyday materials on the basis of their properties, including their hardness, solubility, transparency, conductivity (electrical and thermal), and response to magnets.

Y5 – give reasons, based on evidence from comparative and fair tests, for the particular uses of everyday materials, including metals, wood and plastic.

Electricity

Y4 – identify common appliances that run on electricity.
Y4 – construct a simple series electrical circuit, identifying and naming its basic parts, including cells, wires, bulbs, switches and buzzers.
Y4 – identify whether or not a lamp will light in a simple series circuit, based on whether or not the lamp is part of a complete loop with a battery.
Y4 – recognise some common conductors and insulators, and associate metals with being good conductors.
Y6 – associate the brightness of a lamp or the volume of a buzzer with the number and voltage of cells used in the circuit.
Y6 – compare and give reasons for variations in how components function, including the brightness of bulbs, the loudness of buzzers and the on/off position of switches.

Scotland

Energy sources & sustainability

By considering examples where energy is conserved, I can identify the energy source, how it is transferred and ways of reducing energy. SCN2-04a.

Electricity

I have used a range of electrical components to help make a variety of circuits for differing purposes. I can represent my circuit using symbols and describe the transfer of energy around the circuit. SCN2-09a.

Topical science

I can report and comment on current scientific news items to develop my knowledge and understanding of topical science. SCN 2-20b.

Wales

General

Communication - Pupils should be given opportunities to:

- Use standard measures and S.I. units e.g. kg, s, N, m.

Enquiry - Pupils should be given opportunities to carryout different types of enquiry, e.g. pattern-seeking, exploring, classifying and identifying, making things, fair testing, using and applying models.

As part of the Developing section of Enquiry:

- Use apparatus and equipment correctly and safely;
- Make careful observations and accurate measurements, using digital and ICT equipment at times;
- Check observations and measurements by repeating them in order to collect reliable data;
- Make comparisons and identify and describe trends or patterns in data and information;
- Use some prior knowledge to explain links between cause and effect when concluding;
- Form considered opinions and make informed decisions.

Electricity

How things Work KS2:

- The uses of electricity and its control in simple circuits. Pg. 13b-1.

Interdependence of Organisms KS2:

- How humans affect the local environment, e.g. litter, water pollution, noise pollution. Pg. 12-7.

The Sustainable Earth:

- A comparison of the features and properties of some natural materials. Pg. 13a-3.
- The properties of materials relating to their uses. Pg. 13a-4.

Find out:

Where does my electricity come from?
bbc.co.uk/guides/zcs3srd

Northern Ireland

Interdependence:

- How they and others interact in the world. Pg. 68.
- The effect of people on the natural and built environment over time. Pg. 68.

Place:

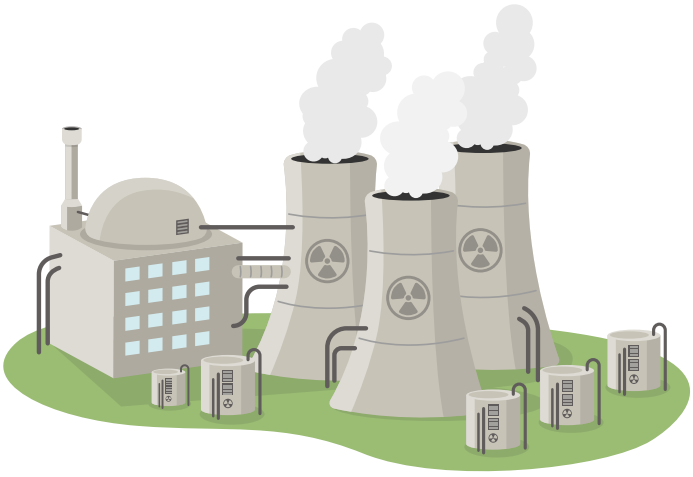
- Positive and negative effects of natural and human events upon a place over time. Pg. 68.

Movement & energy:

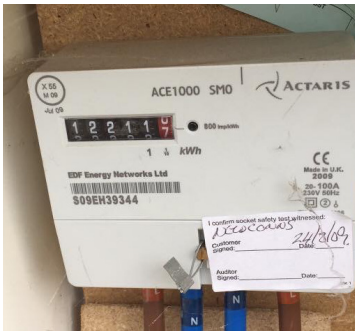
- The causes and effect of energy, forces and movement. Pg. 68.

Change over time:

- How change is a feature of the human and natural world and may have consequences for our lives and the world around us; ways in which change occurs over both short and long periods of time in the physical and natural world Pg. 68.
- The effects of positive and negative changes globally and how we contribute to some of these changes. Pg. 68.



Health & safety



As with any other school activity, the school will need to undertake a full risk assessment of the activity described within this resource. That risk assessment will be specific to the school/class concerned, but we thought it may be useful to list a few key general aspects to consider when preparing that assessment.

- To manage the safe performance of this task, appropriate adult supervision should be provided every time the children read the schools electricity meter.
- Secure access arrangements for the meter should be maintained to prevent unauthorised and unsupervised access by the children outside of the lesson.
- If it is felt that the meter cannot be safely accessed by the children for this task or repeated access is not considered appropriate, a responsible adult could take a photo of the meter so that the children can instead read the meter from the photo.

Important!

Make sure your children know not to switch off electrical items without permission!

Investigating Power

Introduction

Watch the film:

Watch this film to find out more bbc.co.uk/guides/zcwnv9q

Electricity is really useful! We use it for so many tasks like powering lights, heating up our rooms, cooking and cleaning. Before we had electricity we would have to burn fuels such as logs or coal to heat our homes, and burn candle wax to light them. It was really hard work to make sure we had enough fuel in our houses and to keep the fires and candles burning. It also meant that our houses, schools and towns were really dirty from the pollution the fires made. Electricity has made our lives easier and safer, but electricity is still mostly made by burning fuel; it's just done in a power station and not in our houses!

Huge power stations all around the UK generate electricity by burning fuel to heat water, which creates steam. The steam is then used to turn turbines in special machines called generators which generate the electricity we use every day. Every time you turn on an electrical appliance more fuel is burned at the power station to generate the electricity you use. As you might expect, you have to pay for that fuel and the electricity meter in your house records how much you need to pay. At the time of writing, the cost of 1 kWh provided by an electricity company is about 15p.

The fuel we use is split into two different groups: renewable or non-renewable. Non-renewable fuels are the sources that we can't re-use; they include coal, gas, oil and nuclear fuel. When we burn a piece of coal it is totally used up and we can't reuse it. Coal, gas, and oil are also known as fossil fuels. They took many millions of years to be produced from organic matter. The supplies of fossil fuels (and even nuclear fuel) will not last forever: they will run out – hence the term non-renewable.

Renewable sources are more permanent. They can be harnessed to generate electricity without being used up. We can use wind or wave power to turn turbines, and capture the sun's rays to produce electricity. Although we can use these sources again and again without using them up, there is a limit to how much power they can provide and often they depend on the weather.

As well as running out, burning fossil fuels has created another problem. Unlike with renewable sources, every time we burn fossil fuels we release the greenhouse gas carbon dioxide (CO_2) into the atmosphere.
The Earth is naturally warmed by radiation from the sun which passes through the Earth's atmosphere. Some of this radiation is reflected back out to space but greenhouse gases in the atmosphere, including carbon dioxide, form a layer which traps some of the radiation and stops it from escaping into space. The trapped radiation raises the temperature of the Earth and its atmosphere. This effect is called the Greenhouse Effect.

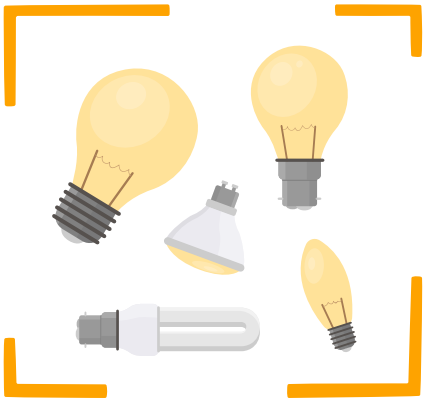
As more and more gases are released by burning fossil fuels, more radiation from the sun is trapped and the average temperature of the Earth rises. This is often known as Global Warming. Global warming affects all parts of the Earth and leads to climate change which brings with it the increase of extreme weather events, rising sea levels, flooding and droughts.

Because of the environmental impact of using fossil fuels, people have started to use renewable fuel sources to generate electricity where possible. However, the UK is still very reliant on the non-renewable CO_2-producing fossil fuels to generate electricity. Until all of our electricity comes from renewable sources it's really important that we don't needlessly use electrical appliances. Reducing their use will reduce the amount of fossil fuel burnt at power stations and help make the natural resources last longer. It will also reduce how much CO_2 we release into the atmosphere!

Thirty percent of power consumed in the UK is 'wasted', so we also need to find ways to reduce the waste. One easy way of doing so is to use 'energy efficient' appliances such as 'energy saving' light bulbs. These require less power to produce the same brightness as an traditional, incandescent bulb. This reduces electricity consumption and in turn the cost to the householder.

Watch the film:

Watch this film to find out more about climate change: bbc.co.uk/newsround/34961514



In schools, a lot of electricity is wasted because poor insulation means more power is needed to heat up rooms. Devices being left on unnecessarily are also wasteful. There are lots of things you can do to help. Every time you turn off a light bulb, or close the refrigerator door fully, you are reducing how much electricity you need which can add up to a big impact on the environment. Together we can reduce global warming, protecting our environment for the future.

In this two-week challenge that was originally created along side the University of Edinburgh, children will investigate the power used by their school. They will look for ways to improve their efficiency, finding ways to change their behaviours and reduce their use of electricity. Schools can then compare how much power they have managed to save with other schools across the UK on the Terrific Scientific map.

Teacher preparation
Suggested activity timetable

You are free to plan in how you deliver the investigation as it best fits your school, but we suggest you run it along these lines.

We've created a series of daily quick fire "power up" activities, which we hope you will use each morning during the two weeks, to keep the momentum going between your science lessons. Each one is a short film, activity, picture or discussion to get your children thinking about power!

We have also included a short lesson plan on the website with suggested lesson structure for each activity.

Week one - How much electricity do we use?				
At the start of week one, show your class the 'Power intro' film & 'How to' film				
Each day: Read the meter, measure the temperature am & pm				
Daily power up activity	Electric detectives: Find your school's power pilferers	Power health check	Heat box investigation	Switch off challenge

Week two - How much electricity can we save?			
Each day: Read the meter, measure the temperature am & pm			
Daily power up activity	Switch off challenge	Electric detectives: Arrest those power pilferers	Review & report your findings

Resources

For Activity 1:

- Electric Detectives sheet.
- Power Health Check sheet.
- Energy Smart Quiz sheet.
- How to read an electricity meter sheet.
- Power Record sheet.

For Activity 2 (per group):

- 2 x Clean empty 200ml juice cartons or heat box templates printed onto thin card.
- 2 x 1.5v filament bulbs and holders.
- 2 x 1.5v batteries AA or AAA size with holder.
- 2 x Wires with crocodile clips.
- Cotton wool / tin foil / adhesive tape / bubble wrap.
- Timer or clock.
- Heat Box instruction sheet.

Note:

All the worksheets are supplied in the separate ‘Student worksheets’ downloadable PDF on the Terrific Scientific website.

Activity 1 – How much electricity do we use in our school? Can we use less?

PDF Resources:

- Power Heath Check
- Electric Detectives
- How to read an electricity meter
- Electricity Record sheet

Watch the film:

Watch this film to find out how to use a thermometer
bbc.co.uk/education/clips/zr9q6sg

Introduction

Schools require a lot of power to keep all of the electrical appliances running. This is provided by electricity companies who generate electricity by burning fossil fuels at power stations. The school has to pay the company for burning the fuel and supplying the electricity, and a meter at the school keeps track of how much the school will be charged.
Electricity can be used to power heating to keep buildings warm, power the lighting, power computers and printers, photocopiers and laminators, cook food; the list is endless. The question is, **how much electricity does a school need to run efficiently?**

In this two week challenge, the children will begin by auditing the efficiency of the school by completing the '**Electric Detectives'** activity followed by the '**Power Health Check'**,

Next, they will complete the '**Power Record' sheet** by reading the electricity meter twice a day and calculating how much the electricity costs in a typical week.

As well as reading the meter, each day across the two weeks the children will record the temperature inside and outside school, and how cloudy the day is, to see if there is a link between how much electricity the school uses and the weather.

In week two everyone will work together to reduce the amount of electricity being used throughout the school. See how many adults and children across the school you can get involved.

At the end of week two, it's time to see if the school has managed to change its behaviour and save electricity!

Note:

Electricity meters can be found in numerous places and every school is different. Ask your site manager or caretaker to help you locate it. Children should not read the electricity meter without an adult present and only if they can read it safely without climbing. If this is not possible then an adult could take a photo of the meter for the children to read more safely.

Reading an electricity meter

Your electricity meter keeps a record of how much electricity you are using so that your electricity company can send you a bill. Electricity consumption is measured in kilowatt hours (kWh), from which the electricity company calculates the cost to the school. There are different types of electricity meter – digital, electronic and dial meters. Using the **'How to read an electricity meter' sheet** will help the children to practice reading electricity meters. It should be noted that when reading dial meters,the dials are read from left to right, and if the pointer is between the two numbers, always take the lower number. Throughout the two week challenge, the children will be asked to record the school's meter reading twice a day and to work out how much electricity was required over the school day. Show the children how to calculate the day's electricity usage by subtracting the afternoon reading from the morning (use the 'Electricity Use' sheet) They will also be asked to measure the air temperature inside and outside twice a day too, along with the amount of cloud cover. **Do you notice a link between the weather and how much electricity your school uses?**

Two-week energy challenge

Your challenge is to make your school more efficient and therefore reduce the electricity bill. To help you measure your school's power usage, you are going to read the electricity meter twice a day for two weeks – first thing in the morning and at the end of the school day. Readings will not be taken on Saturdays and Sundays. In week one, the school will be operating as usual, don't make any changes! In week two, the challenge is to save as much electricity as possible and to see how much your meter reading goes down. Ask the children to record their readings on the **'Power Health Check' sheet.**

Remember:

Don't make any changes yet, we want to see if you can reduce your electricity usage in week two!

Tip:

Make sure your detectives make a note of any problems they can find!

Week one: Power health check

First, it's time for your class to become Electric Detectives! Working in groups, ask the children to walk around the whole school and complete their **'Electric Detectives' sheet.**

In section 1 - they'll need to track down as many 'problem' devices as they can and make a note of the problem, and where they are in the school.

- Which devices run on electricity?
- Which ones can you find which are on, or on standby?
- Do they need to be on or are they wasting electricity?

In section 2 - are there any other problems?
Although we're focusing on electricity in this investigation, it's still important to be as efficient as possible. Even if your heating is not powered by electricity, but fuelled by gas or oil you should still identify any efficiency problems you can find.

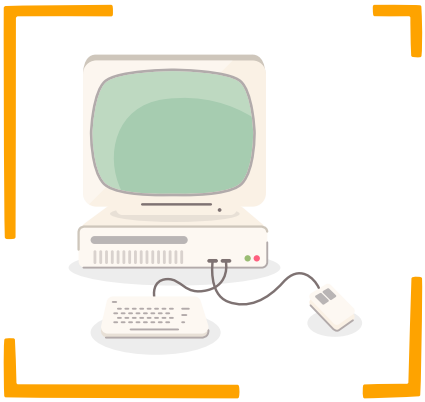
- Are there windows or doors left open when the heating is on?
- Are there drafts coming under the doors?

Make sure your detectives make a note of any problems they can find!

Power health check audit

In order to make a baseline assessment of efficiency in your school, we need you and your class to complete a Power Health Check. Every school is full of 'power pilferers': devices that needlessly draw on the electrical supply. They have a serious impact on efficiency. It could be computer monitors left on standby, photocopiers left on all night, or even windows left open while the heating is on.

As a class, work through the **'Power Health Check' sheet** to find out what base level your school is starting at:



Gold: (31-40) Your school is really efficient already but there will still be some improvements you can make.

Silver: (41-69) Pretty good but there is still some Electric Detective work to be done!

Bronze: (23 - 30) Time to spring into action and use all of your Electric Detective skills to improve efficiency!

Talk through with your class all of the problems and devices they have detected. Work through and ask:

- How will you communicate with the rest of the school about the power pilferers we have found?
- Is it easy to fix the problems you have found?
- What will we do in week 2 to save electricity and make our school more power efficient?

Finally try our **'Energy Smart Quiz'** to see how power smart you are.

Ask:

How will we make a change?

How else could you save electricity in week two?

Week two: Do the Switch Twitch – Carry out your energy saving ideas!

Plan

Ask the children to make a list of ideas of how they might save electricity in week two.

Measure the temperature of your classrooms. The recommended temperature for classrooms is 18°C. If they are warmer than that perhaps you could ask the site manager or caretaker to turn the heating down by one degree?

Watch the Switch Twitch video and listen to the song, does it give you any ideas for your school?

Which devices could be turned off?

How else could you reduce your school's power consumption?

Do the doors have draft excluders?

Do

Throughout the second week work together to save as much electricity as possible – you should start to see that your daily electricity usage is less than in week one.

How could you present the data from your meter?

How can you mathematically show how much electricity you have saved?

Ask:

Which members of staff will need to be involved?

How could other classes help you realise your plans?

Watch the film:

The music video **Switch Twitch!** will give you inspiration to become Electric Detectives: bbc.co.uk/programmes/p05qrz6q

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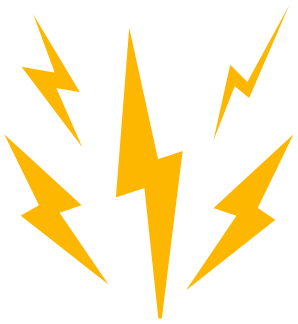
Discuss:

Week 1: How many kWh of electricity does your school require in a normal week?

Week 2: Make a change: How many kWh of electricity does your school require in an efficient week?



Tip:

Why not share your posters and songs with us on social media using #terrificscientific

Review - Redo the audit

At the end of week two revisit the 'Electric Detectives' activity. This time fill in the 'week 2' column.

Have the problems you identified been solved?

How have we reduced the amount of electricity our schools needs?

Could we continue to reduce our power requirements in this way?

What further ideas do we have to reduce this even more?

Did you make a change?

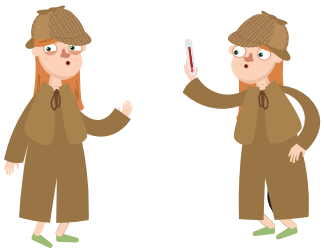
How has the investigation changed what you know about power?

Calculate your exact savings

Have you reduced the electricity cost in week two compared with week one? At the end of week two, ask the children to calculate the total electricity cost (measured in kWh) in both weeks, and then work out if there has been a saving in electricity usage in week two. To do this, they simply need to subtract the total kWh figure from week 2 from the total kWh figure from week 2. The result will be your total saving measured in kWh.

Communicate

How did you achieve the biggest saving? Design a 'My Greatest Switch Twitch' poster (see student worksheets). You could write new lyrics for the switch twitch song; create a poem or rap; draw a picture; take photographs; write a story or newspaper report. Make a display of your posters to explain to the rest of the school the work you've done!



Activity 2 - How can we be more power efficient?

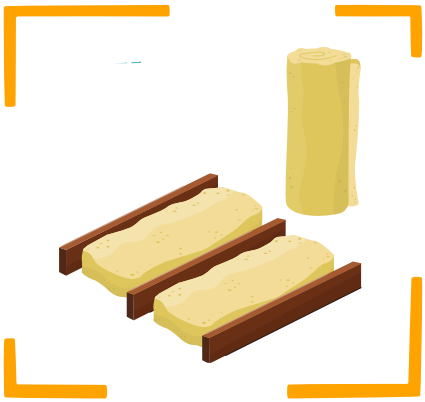
Introduction

It is really easy to be wasteful when heating up your home or school. Waste occurs by leaving windows open or having poor insulation. The waste results in using more fossil fuels, such as coal, oil and gas, than needed and is a major contributor to climate change. We all have a role to play in using fossil fuels more wisely. By making simple changes we can all be more efficient. Watch this film about a super insulated, passive house in Scotland with your children.

Watch the film:

Ask the children why doesn't the house cool down as quickly as other houses.
bbc.co.uk/education/clips/zwy7xnb

In this activity the children will explore how thermal insulation works and consider what impact it can have on our power use.



Thermally insulating material prevents hot things from being able to warm up anything colder than them, a process which would also make the hot thing colder. Insulation around hot-water heaters stops the hot heater from warming up the surrounding room. Insulation can also be used to keep cold things cold. The insulation in the walls of a refrigerator prevents the warmer room from heating up the cold fridge keeping the food in the fridge cold! Poor insulation means that fossil fuels are wasted trying to keep hot things hot and cold things cold. The best insulation materials keep things at a constant temperature (if you wrapped a cup of tea in a perfect insulator, it would never cool down!). Typically, good insulators are made of non-metallic materials filled with tiny air pockets.

The children are going to make two 'heat boxes', a simple system consisting of a confined space (the box) heated by a small bulb where the internal temperature of the box can be measured with a data logger or thermometer.

One box will be insulated and one left un-insulated.

They are then going to measure the temperature in the heat box every ten minutes and record what happens. We suggest that children do this activity in week one so that they can use the knowledge they gain about making a system more energy efficient in week two.

Tip:

For maximum insulation, the insulated box needs to be thickly covered on all sides. Cotton wool roll works well.

Where can you find electricity in nature?:

Electricity isn't just something that is made inside power stations, it can be found in all sorts of unexpected places in nature.
bbc.co.uk/guides/z3xgy4j

Method

1. Ask the children to design a table to record their results for each of the heat boxes. They should include columns for Time and Temperature.

2. Ask the children what they expect to happen to the temperature during the experiment?

3. Make two heat boxes by following the **'Heat Box instruction sheet'** PDF. You can use either a data logger with a temperature probe or a thermometer to measure the temperature of your heat box. When we tested this experiment we found that our maximum heat gain was around four degrees.

4. Insulate one of the heat boxes with a roll of cotton wool and tin foil. Leave the other heat box un-insulated.
   Ask the children, 'why do we need two heat boxes?'

5. The children should take the temperature of each heat box at the very beginning of the investigation and then every ten minutes thereafter for an hour. They may find that they have different starting readings in each box. That is OK. They simply need to work out which box they had the largest temperature change.

Extension ideas:

Once the children have investigated this basic idea there are lots of additional questions that children could investigate. For example try:

- Using different insulating materials.
- Using different thickness of insulating materials.
- Different sizes of box.
- Investigate what happens if you run the experiment for longer than an hour – for example, overnight.
- Build a house out of interlocking plastic play bricks, adding insulation and explore the efficiency of insulation in different parts of the building – the floor, roof, walls.

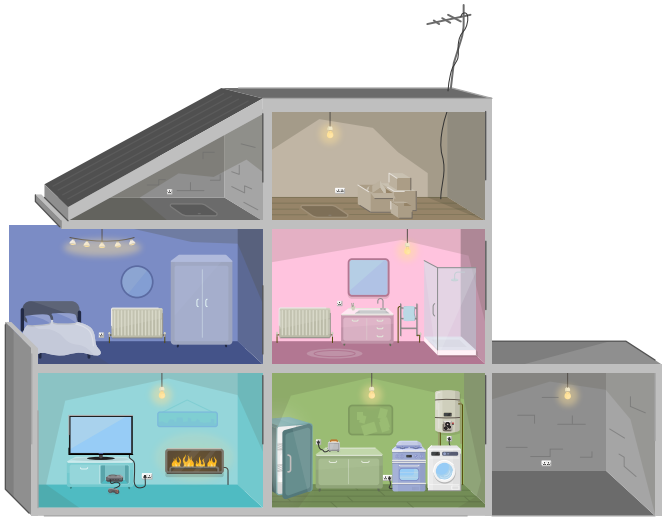
Review:

Ask the children to reflect on their investigation:

- What difference did insulation make?
- Where is your home or school insulated?
- Do you think that the insulation in your home or school could be improved?
- How does insulation help you save on your electricity bill?

Watch the film:

about the power of insulation:
youtu.be/P6fEMxH_EpE



Glossary

Watts (W)	Watts (W) A unit for the scientific measurement of power and is written as a “W”. It is named after the Scottish inventor James Watt (1736-1819). It is used to quantify the rate of energy transfer; one watt is equal to the transfer of 1 joule of energy per second. For electrical appliances, it tells us how bright, how hot or how loud the appliance is. A more powerful light bulb will tend to be brighter than a less powerful one. This means the more watts an appliance requires the more energy is transferred per second! 1000 watts is called a kilowatt, which is written as “kW”.
Kilowatt-hours (kWh)	A kilowatt-hour is unit of measurement of the energy transferred over a period of time, it is written as “kWh”. It is calculated by multiplying the number of kilowatts (kW) required by an appliance by the time it was used for (in hours). A 100w (or 0.1kW) light bulb that was on for 10 hours requires 1kWh of energy transferred. This is the unit that electricity companies use to measure how much your electricity bill will be. At the time of writing, a kWh costs about 15p.
Electric Meter	An electricity meter or energy meter is a device that measures the amount of electricity energy transferred within the building. The rate at which the dial is turning indicates the power consumption of the building at that instant. The difference between the readings at two points in time indicate the energy transferred over that time; they also indicate the cost to the customer.
Standby	When an electrical device is switched on but it is not actually functioning. When a device is on Standby power it is still requiring electrical energy even though the device isn’t being used. Often devices will show a small light or clock to indicate they are in standby mode.
Electrical Device	An electric device requires electrical energy to perform a task. For example; toaster, radio, TV, oven, hair dryer or electric light.
Data logger	A data logger is an electronic device that records data over time. It may have a series of internal or external sensors which you plug in, measuring for example, temperature, light or sound. Data loggers are a useful means of helping children to care accurate and systematic measurements and introducing them to decimal numbers in context.
Electrical Current	is the flow of electric charge (or electricity) around a circuit; it is measured in amperes or amps, written as “A”. To make an electrical current we need a store of electrical energy (such as a battery) and a path for it to travel along (such as wires).
Battery	Batteries are a store of chemical energy. Chemical reactions inside the battery transfer chemical energy in to electrical energy. They were invented by an Italian physicist Alessandro Volta in 1799!
Conductor	Electrical conductors all electric currents to flow easily through them. Thermal conductors will be bad at keeping things at a constant temperature.
Insulator	Electrical insulators are materials that don’t allow an electric current to flow through them. They are used to prevent us getting electric shocks from electric cables. Thermal insulators are great at keeping things at a constant temperature. They will keep cold things cold and hot things hot.