



TEACHER NOTES

WHAT'S GUZZLING THE POWER? QUICK ACTIVITY

KS2

SAVE INK - don't print this first page!



Lesson overview

In this activity, students learn about which devices and appliances use electricity; how much power each requires to operate; and how they can reduce their own use of electricity.

Learning objectives

- ▶ Learn about the importance of electricity to our lives
- ▶ Learn which of our appliances/activities use the most power
- ▶ Understand that lifestyle choices can save or waste energy
- ▶ Consider how these lessons might apply outside the home – and the role of people whose job it is to monitor an organisation's energy use

Subjects

Science
PSHE

Gatsby Benchmarks

This activity supports the following Gatsby Benchmarks:
2: Learning from career and labour market information: Learn about careers in energy and the routes into them.
4. Linking curriculum learning to careers: Energy and Facilities Managers need to know which appliances are more energy intensive, and consider ways their organisation can reduce its electricity use to save money.

Timings

- ▶ Warm-up: 10 minutes
- ▶ Main activity: 40 minutes
- ▶ Careers in energy: 10 minutes

Materials and set-up

This Activity Pack contains the following materials:

- ▶ Teacher notes
- ▶ Student worksheet

This activity can be used in the classroom, led by a teacher. Or share these Teacher notes and the Student worksheet with families who are home schooling.

WARM-UP (10 minutes)

Part 1: It's electric!

We use electricity to power many things in our homes: from mobile phones to games consoles, and kettles to lights.

Ask students: How do you know it's in your home, if you can't see it?



HPC Inspire

We're Hinkley Point C's Education Programme in Somerset and the wider South West region. And we're here to help young people take advantage of the huge opportunities that the construction and

operation of HPC has to offer. We do this through a range of fun and innovative activities: including hands-on STEM workshops, careers assemblies and online learning resources.

What's Guzzling the Power? quick activity **KS2**



Electricity comes into our homes through power cables. We can't see it. But we are able to use it by plugging in things like our PlayStation, TVs and kettles to power sockets in the walls. Electricity is also used to power our lights.

Some people also use electricity to heat their home and to charge their car.



Did you know?

By the time you're able to drive, most people will be driving some form of electric car. You won't ever need to go to a petrol station again to fill up! But will be able to recharge your car from home, in a car park or even on the street.

THE MAIN ACTIVITY

(40 minutes)

Part 1: Does it use power?

Electricity provides clean, affordable and safe power, exactly where and when we need it. In our homes, it powers the appliances, lights and devices that make our day-to-day lives easier and more enjoyable... Can you imagine not having a light to see at night time? An oven to enjoy a hot dinner? Or life without a games console?

Ask students to look at the 10 household items in their Worksheet and circle the ones that use electricity. You can make it more challenging by asking if each uses mains or battery power – some can use either!

What's Guzzling the Power? quick activity **KS2**

ITEM	DOES/DOESN'T USE ELECTRICITY?	MAINS OR BATTERY?
Washing machine	Yes	Mains
Oven	Yes (usually)	Mains
Central-heating radiator	No	N/A
Desk fan	Yes	Mains
Laptop computer	Yes	Either
Toilet	No	N/A
Games console	Yes	Yes, or either (e.g. Nintendo Switch)
Mobile phone	Yes	Either
Flashlight	Yes	Battery
Scissors	No	N/A

Part 2: Does it guzzle power?

Watts and kilowatts

Every appliance and gadget has a power rating, which tells you how much electricity it needs to work. This is measured in watts (W) – for example a 10W low-energy light bulb.

Watts are quite a small measure, so for more powerful appliances we use kilowatts (kW):

1,000 watts = one kilowatt

An oven rated at 2kW (2,000W) needs 200 times more electricity than a 10W low-energy light bulb!

Now let's work out how much power different appliances around the home need to operate! Cut out the 12 pictures at the back of this activity. You'll only need one set if you're running this activity at home. But if you're in the classroom, consider dividing the class into smaller groups and give each group a set of 12 pictures.

Ask students to look at each of the appliances and devices. Which do you think uses the most electricity? Which uses the least? Ask them to place the pictures of appliances in order from highest to lowest demand.

What's Guzzling the Power? quick activity **KS2**

Use the table below to guide a discussion about the students' answers. Prompt children to explain why they've chosen the order they have.

Rearrange the items, if necessary, into the right order and discuss it with the students. Which ones are they surprised by? Can they see a link between the types of devices that use lots of electricity, and the ones which use less? Typically, the most power-hungry devices all heat things, while the middle-ranking ones contain motors. Gadgets tend to use the least power.

ITEM	POWER RATING ¹	DISCUSSION POINT
Kettle	2.2-3.0kW ²	It takes a lot of energy to heat things!
Washing machine	2.2kW ³	
Oven	2.2kW	
Toaster	1.2kW	
Laser printer	800W ⁴	Laser printers 'melt' toner onto the page using special rollers called fusers ⁵ . It takes quite a bit of power to heat them up!
Vacuum cleaner	800W ⁶	
Fridge freezer	300W	The compressor needs quite a powerful motor to drive it
TV	150W	
Games console	120W ⁷	
Laptop	Up to 65W ⁸	
Light bulb	10W	
Mobile phone	10W ⁹	When fast-charging

1 We've used the median values from here unless noted otherwise – and have checked the other values against this list, too

2 3.0kW and 2.2kW

3 The A+++ Samsung is rated at 2.0-2.4kW, so we've taken the median

4 We estimate the average peak consumption is around 800W

5 <https://www.explainthatstuff.com/laserprinters.html>

6 Dyson small ball 700W, Miele PowerLine 890W

7 <https://www.anandtech.com/show/7528/the-xbox-one-mini-review-hardware-analysis/5>

8 This is a reasonable figure for a high-spec Windows laptop, but it can be far lower. A Chromebook only uses 5W when fully charged, but is a very low-power computer

9 The Centre for Sustainable Energy says up to 5W, but most modern smartphones support 2A charging over USB, which is 5V, so you get a maximum of 10W

Understanding kilowatt-hours

Watts and kilowatts tell us how much power a device is using at any instant. However, to really understand energy use you need to know how much power they use over time. Because a power-hungry device might not actually get used very often. Whereas a device that doesn't seem to use much power could actually use a lot of energy if you use it all the time.

Kilowatt-hours (kWh) tell us how much power a device uses at a certain point in time. 1kWh is the amount of energy you would use if you kept a 1,000 watt appliance running for an hour. So if you have a 1kW vacuum cleaner and it takes you one hour to clean the house, you've used 1kWh. If it takes two hours, you've used 2kWh – and you should probably ask for more pocket money!

Quick quiz

1. **Q. How do you think you work out how much power a device needs to work?**
A. You can usually get the answer on the rating plate or label on the device.
2. **Q. Would this figure be in watts/kilowatts, or kilowatt-hours?**
A. Watts or kilowatts.
3. **Q. How might you work out how much power a device has actually used?**
A. Multiply the power rating by the amount of time (in hours) the device was actually on.
4. **Q. What unit would we use for this figure (watts/kilowatts or kilowatt-hours)?**
A. Kilowatt-hours.

Part 3: Count the hours

Ask students to rearrange their pictures of appliances – this time in order of how much power they might typically use in a year.

Use the table below to guide a discussion about their answers. Prompt children to explain why they've chosen the order they have. Rearrange the items, if necessary, in the order below and discuss it with the students. Which ones are they surprised by? Can they suggest a reason why some devices (e.g. fridge or games console) use more or less power than they were expecting?

ITEM	APPROX ANNUAL USE (KWH)	BASED ON?
Fridge freezer	270 ¹⁰	EU energy label
Oven	50-150 ¹¹	Used every 2-6 days
Washing Machine	130 ¹²	EU energy label
Kettle	105 ¹³	Used five times a day

¹⁰ Approximation for A+ based on Samsung range

¹¹ This is going to vary hugely, but we've used the 0.81kWh per cycle figure of [this Bosch](#), and worked it based on a cycle every two to six days

¹² This is the energy rating value for our writer's washing machine

¹³ Our writer's 2.3kW kettle takes 1.5mins to boil two cups' water. We've assumed it does that five times a day, 365 days a year

ITEM	APPROX ANNUAL USE (KWH)	BASED ON?
TV	100 ¹⁴	EU energy label
Games console	90	Used two hours a day
Laptop	80 ¹⁵	Used eight hours a day during the working year
Toaster	30 ¹⁶	Two rounds a day
Light bulb	22	Six hours a day
Vacuum cleaner	21	30 minutes a week
Mobile phone	7	Two hours a night
Laser printer	1 ¹⁷	One short print job a day

Part 4: Be savvy with savings

Now you know how much electricity different appliances use around the home, let's think about how we can reduce it!

Can you suggest three ways you could save electricity? Answers might include watching less TV or gaming less, remembering to turn off lights or, for older children, not over-filling the kettle.

What about the adults in the house? Are there other ways to save energy and money? Consider not just appliances and gadgets, but also things like heating and hot water. Can you think of any smart technologies that might help save energy and cut costs in the home?

Answers might include watching less TV or boiling the kettle fewer times and turning off lights. Turning down the heating helps, as does taking showers rather than baths. Smart lighting can help reduce power use, for example by turning off lights on a schedule. Smart heating controls do the same, or can even ensure the heating and hot water turn off automatically when nobody's home.

Finally, think about whether what we've learnt applies outside the home. What about an office, which is full of equipment like lights, laptops, printers, even kettles and toasters?

¹⁴ Approx based on this Samsung

¹⁵ Approx based on 40W, used eight hours a day for five days a week, 48 weeks a year

¹⁶ Calculated for two rounds of toast, taking two minutes each, each day

¹⁷ Based on using it once a day and the print job taking 20 seconds. The average consumption is lower than the peak – typically around 300W. That gives about 0.6kWh per year

CAREERS IN ENERGY (10 minutes)

Part 1: Who checks up on schools and business' energy use?

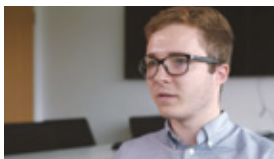
Big companies often have Energy or Facilities Managers¹⁸: people whose job it is to ensure facilities and energy equipment are available and safe to use at work. How might they be able to reduce the energy used by the company? You could have a look at the **National Careers Service** for more information about what this job involves.

Why not talk to your school Caretaker or Facilities Manager about the school's use of energy too? What does the school do to make sure energy isn't being wasted? How does the school keep track of its energy use? Could you help – for example by designing a 'Switch it off!' notice to place near light switches and other equipment that's been left on?

Part 2: Future jobs in the energy industry

We're building Hinkley Point C (HPC) in Somerset: the first new nuclear power station in 25 years. It will generate low-carbon electricity for around 6 million homes! HPC is important for our country because we need to generate electricity from more low-carbon energy sources, like nuclear, wind and solar power. By the time you've left school, we'll have started producing electricity at Hinkley Point C. And we'll need about 900 people to work here and keep the power station running... So we'll be looking for people like you to come and work for us!

Lots of young people start their job at HPC on an apprenticeship. With an apprenticeship, you get a qualification and learn while doing a job, instead of going to college or university. The other benefit is you get paid to do it too!



Watch **this film** of Joel, a Nuclear Business Apprentice, to find out what he loves about his apprenticeship.



Hear from Alisha in **this film** about what she's learnt on her apprenticeship at HPC – and how the new power station is benefitting the local community.

Find out more about **apprenticeships**

HOMEWORK ACTIVITY

Energy-saving challenge!

Pick your favourite idea for saving energy at home, and pledge to do it for a week. See whether the change is easy... If it is, think about going further, or making the change permanent! Ideas might include gaming for 15 minutes less each day, or watching 30 minutes less TV. Other ideas might be wearing an extra layer indoors and turning the thermostat down, or pledging to turn off lights when you leave a room.

Curriculum links

Science: Working scientifically; Electricity

PSHE: Living in the wider world: L5. ways of carrying out shared responsibilities for protecting the environment in school and at home; how everyday choices can affect the environment (e.g. reducing, reusing, recycling; food choices).

Find out more about **Hinkley Point C** and **careers in the low-carbon energy industry**

¹⁸ <https://nationalcareers.service.gov.uk/job-profiles/facilities-manager>



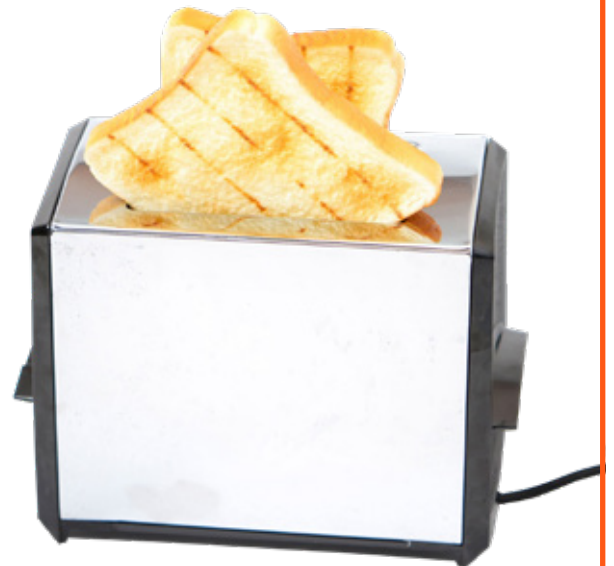
Kettle



Washing machine



Oven



Toaster



Laser printer



Vacuum cleaner



Fridge freezer



TV



Games console



Laptop



Light bulb



Mobile phone

THE MAIN ACTIVITY

Part 1: Does it use power?

Look at the 10 household items below. Circle the ones that use electricity.



Part 2: Does it guzzle power?

Quick quiz

1. **Q.** How do you think you work out how much power a device needs to work?

A. _____

2. **Q.** Would this figure be in watts/kilowatts, or kilowatt-hours?

A. _____

3. **Q.** How might you work out how much power a device has actually used?

A. _____

4. **Q.** What unit would we use for this figure (watts/kilowatts or kilowatt-hours)?

A. _____

Part 4: Be savvy with savings

Now you know how much electricity different appliances use around the home, let's think about how we can reduce it!

Can you suggest three ways you could save electricity?

1. _____

2. _____

3. _____

Find out more about **Hinkley Point C** and **careers in the low-carbon energy industry**