WESTMILL

WeSET

SUSTAINABLE ENERGY TRUST

Energy

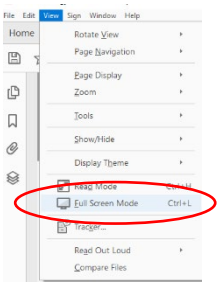
Lesson 1

This guide is designed to accompany and complement:

- Presentation: **Energy**
- Single page lesson plan: **Energy**
- Worksheet: **Energy** (including activities and possible extension tasks or homework)

The guide goes into greater detail than the single page lesson plan and includes suggested resources and elaborates on each slide in the presentation.

Presentation Tips:



- When opening the PDF presentation, you can select how it is displayed. If you wish to **click through** as opposed to scrolling (which gives you more control as you progress and is more like a conventional ppt) it is best to show it in '**full screen mode**' (press 'escape' to exit).

- All associated documents are attached to the presentation. To find these, click on the **paperclip icon** in the left-hand toolbar.

- When viewing the presentation, presenter notes from this delivery guide are also available for reference if you hover the cursor over the small orange callout icon in the top left corner. **Fig.1**

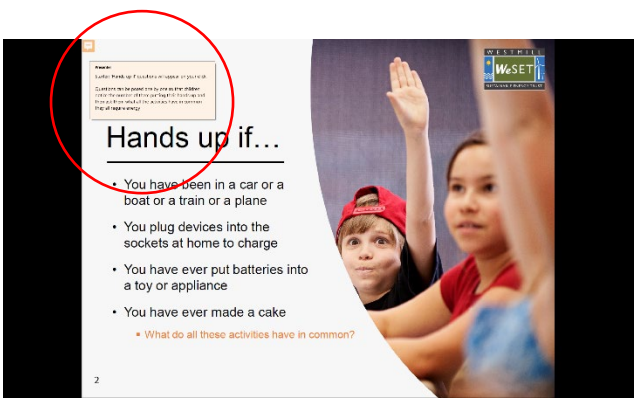


Fig.1

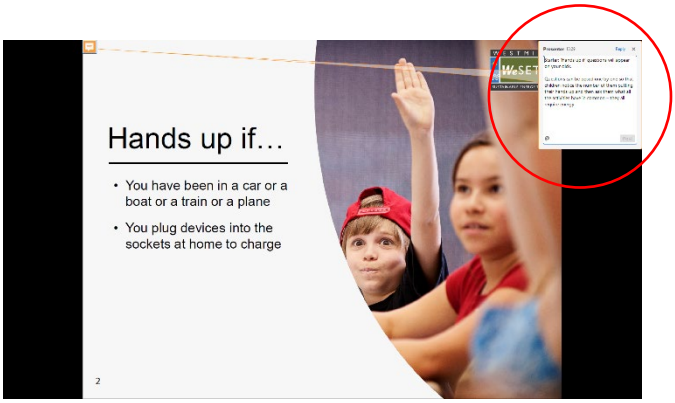


Fig.2

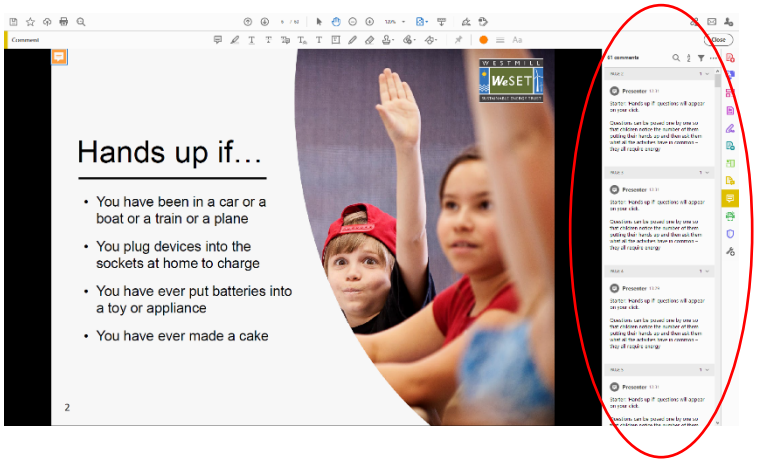


Fig.3

- If you **right click** on that icon it will open a small window showing presenter notes in the top right of the page. **Fig.2** If you right click and scroll down, you can also choose to click '**show comment app**' which opens a panel on the right of the page showing all the presenter notes as you scroll through. **Fig.3**

20 minutes to fill? You could use the introduction slide and then show the 'what is energy?' video clip [5m00s] to start a discussion about energy and the ways we use energy in everyday life	**Slide 2** **Slide 14**

Slide number refer to the **numbers on the slides themselves**	This presentation is designed to allow the presenter/teacher to pitch it as appropriate to higher KS2 or lower KS3 (approximate age range 6 – 12 years). Questions that are on the slides have been differentiated by colour in this guide, with **red** being most challenging. 🏆 Those marked with this icon **may not appear on the slide** and are optional, higher level questions. Points marked with this icon **may not appear on the slide** but can be used as a starting point for a personal investigation activity and for extension where appropriate. **Advisory!** All videos are linked to external players (usually YouTube) these have been chosen to complement and reinforce learning and have been chosen carefully. However, we would **advise that you watch them yourself prior to showing them** to ensure that you hare happy that the content is right for your children or class.	**Suggested resources**	**WeSet resources**
2	Starter: 'Hands up if' questions will appear on your click. • **Questions can be posed one by one so that children notice the number of them putting their hands up and then ask them what all the activities have in common – they all require energy**		PDF presentation, worksheet and lesson plan
3	Start the lesson by asking the question 'what is energy?' As you elicit responses from children, use single clicks to bring up simplistic definitions, this will be elaborated on later. • **Ask children to think about how their body uses energy – to keep warm, to move** **Where does your energy come from? – the types of foods and drinks we consume contain chemical energy that is converted by our bodies into the types of energy we need (heat energy, kinetic energy etc)** Introduce the fact that there are many types of energy.	Examples of food or drink packaging https://www.dkfindout.com/uk/video/human-body/how-much-energy-is-in-your-food-video/ [2m39s]	

4	🏆 **If something has 'potential', what does this mean? – Being capable of having or developing something** Introduce the idea of potential energy as energy stored before use, you might like to use a prop like a yoyo, wind-up toy or torch to demonstrate this. • **Where else might you find potential energy? - answers may include: A coiled spring, a drawn bow or catapult, a runner in the starting blocks, a cyclist / skateboarder / roller skater at the top of a hill, a rocket before launch, a person at the top of a slide or jump etc**	A yoyo or windup toy	
5	You may like to use the example of the surface of a trampoline as having potential elastic energy. Once jumped on it displays elastic energy. 🏆 **What is the difference between elasticity and plasticity? – If something has elasticity it can be manipulated and deformed but this deformation is reversable, if something has plasticity it can be manipulated and will deform but this is irreversible** • **Can you suggest an Olympic sport that relies on elastic potential energy? – archery: drawing back the string in the bow forms elastic energy, diving: a diving board has potential elastic energy, pole vault: the pole bends forming a spring like elastic energy (accept any other applicable answers like trampolining)**	Elastic bands	
6	This is a good point at which to highlight that several different kinds of energy can be in play at the same time. • **What increases as the gravitational energy is transformed into kinetic energy as the parachutist falls? – Speed** 🏆 **What type of energy is gravitational energy? – gravitational energy is a form of potential energy** Whilst we cannot see it, gravity is the natural pull of the earth which means that the parachutist falls from the aircraft back towards the earth.	A ball or something that can be safely dropped	
Hand out Worksheet 1 Energy			

7	**Task 1** This slide can be used alone or in conjunction with the differentiated **worksheet** where children can write their answers in the table provided for recorded formative assessment. • **Ask children to use the words in the list to fill in the gaps in the sentences – once you have gone through the task, the answers will appear one by one on the click of the mouse** **There is a brief extension task on the worksheet**		Worksheet 1 Energy
8	🏆 **What is a mechanism? - A mechanism is a system of parts that translate energy input into an action for example when you pedal a bike this action causes the gears to rotate and the wheels to turn resulting in movement** • **When the mechanical arm stops at the top of its rotation, what type of potential energy does it have? – at the top of the rotation the ride will have potential gravitational energy** Other examples of mechanical energy include: Anything with a working mechanism – a construction crane, windmill, engine, bike, gears, scissors and shears, clock etc.	A simple mechanism like a bottle opener or tin opener	
9	Suggest that children gently put their fingers on their voice box and make a note like 'la', they should feel gentle vibrations. • **What process produces sound energy from a bell? – the clapper hangs on a pivot and when the bell is swung it strikes the body of the bell causing a vibration and sound. Bells are made from 'sonorous' materials like bronze and brass and so the vibrations cause a ringing sound** • **What term do we use to describe different levels of sound? – volume (although sound intensity is measured in decibels)** 🖇 **How might we demonstrate sound energy visually? – using a drum, place rice or confetti on the skin of the drum and gently beat the drum, the vibrations will cause the rice/paper to jump demonstrating the energy of the sound generated. This can also be done (with care and permission!) with confetti on a speaker cone**	A drum or bowl with a fabric stretched across the top tightly and something o percuss it. Torn pieces of paper or rice	

10	Good examples of catalysts are rubbing your hands together, boiling an electric kettle or putting a pan of water on a campfire. Thermal energy is transferred by conduction, convection or radiation through heat. The hotter an object is, the more thermal energy it has. • **What word do we use for the measurement of thermal energy? – temperature** 🏆 **What do we call the natural thermal energy that can be used to generate electricity and heat for homes? - Geothermal energy is thermal energy generated and stored in the Earth. It can be seen at places where the earth's crust is so thin that water near the surface is heated to form steam** **In some parts of the world this is evident in eruptions called geezers or hot pools (Iceland) but when deeper down, it can also be pumped to the earth's surface for use in heating and electricity**	Gel handwarmers demonstrate thermal energy as a result of a chemical reaction. This clip also illustrates thermal energy nicely [0m20s] https://www.youtube.com/watch?v=MDA64o5ivqA	
11	• **Ask children if they can name a natural source of light energy – The sun and also stars as well as fire, children may also suggest the moon which is a good observation although it is important to note that moonlight is the reflected light of the sun** You might like to discuss the type of light bulbs children have in their homes and why they might now choose LED bulbs instead of incandescent bulbs. LEDs although currently more expensive are more efficient (requiring and loosing less energy) and lasting longer (the average lifespan of an incandescent bulb is 1,200 hours versus 25, 000 hours for an LED bulb of equivalent strength!) 🖋 **If an incandescent bulb is bought for £0.80 and lasts for 1,200 hours and the equivalent LED bulb is bought for £3 and lasts for 25,000, how many of each bulb would you use over a 10-year period and what would the cost for each be? – Incandescent: you would need 73 bulbs at a cost of £58.40 LED: you would need 4 bulbs at a cost of £12 (10 years = 87600 hours)** • **What is the most common type of energy that we convert into light energy nowadays? – Electricity: Electric light is formed when an electric current is passed through a fine wire in the element**	Examples of different types of bulbs – to take this a step further use a table lamp to demonstrate the level of heat coming off different bulbs	

12	Explain that **chemical energy** is also a form of potential energy as it is usually stored within a compound, for example: Coal, wood, food etc and is then released due to a **chemical reaction** with another material or substance. 🏆 **What does the word catalyst mean? – A catalyst is a substance or act that initiates or speeds up a chemical reaction, for example temperature is used as a catalyst in food preparation** • **What happens when we burn wood or coal on a BBQ?** **– as the material burns, the chemical energy within the compound (wood or coal) is converted to heat and light energy** • **What other chemical reactions release energy that we can use? – good examples include: the food we eat which is converted from chemical energy into other forms of energy to be used by our bodies. Plants photosynthesize energy from the sun into chemical energy. Batteries store chemical energy which is converted into electricity**	Matches, batteries, an apple etc	
13	Kinetic energy builds with movement as speed increases and is lost as movement and speed reduce. • **Ask children what type of energy the lift that takes the skier up the mountain uses – it uses mechanical energy (they may also mention electrical energy at this point which is an excellent observation, electrical energy will be explored in more depth later)** • **Ask children what other types of energy can be converted into kinetic energy – mechanical energy, for example turning the pedals of a bike causes the bike to move. Electrical energy for example an electric train or car. Light energy, waves of light travel from the sun (the speed of light). Sound energy, vibrational waves can be converted into kinetic energy. Thermal energy for example the heat of a candle can cause a pinwheel to turn etc** 🏆 **How can kinetic energy be transformed into electrical energy? – the kinetic energy of the wind is used to turn wind turbines which in turn power a generator, creating electrical energy. The kinetic energy of steam can be used in the same way**	If you choose to demonstrate this, you can create a slope using flexible card propped on books and use a suitable object as the skier This page features a nice animated illustration that demonstrates this https://www.physicsclassroom.com/mmedia/energy/se.cfm	

14	The electrical energy we use comes from a wide range of sources including oil and gas, wind, solar, nuclear, wave and tidal and biomass. Other types of energy can be transformed/converted into electrical energy including chemical, thermal, kinetic and mechanical. Electrical energy itself can be transformed into many other forms of energy including heat energy and light energy. • **What natural form of electrical energy might we see on a stormy day? – lightening** **Which British scientist discovered the fundamental principle of electricity generation in the early 1800s? - Michael Faraday** The sources of electrical energy will be discussed in much more depth in the next lesson presentation.		
15	You can choose whether to show the video clip as it will only commence once you have **clicked on the 'play' icon**. The clip runs for [5m00s] and nicely consolidates learning and reviews the different types of energy.	https://www.youtube.com/watch?v=Q4M-g8fiJ2I&feature=emb_logo [5m00s]	Embedded clip in ppt
16	**Task 2** This slide can be used alone or in conjunction with the differentiated **worksheet** where children can write their answers in the table provided for recorded formative assessment. • **Ask children to match the types of energy listed in the boxes with the relevant image – arrows will appear one by one on the click of the mouse**	Any relevant product examples you feel may help with the exercise	Worksheet 1 Energy
17	A nice way to describe energy transformation is using the example of a music box or windup radio or torch in which mechanical energy is transformed/converted into electrical energy which in turn transforms into either sound or light energy. • **What energy transformation takes place when we pedal a bicycle? – the chemical energy in your muscles is converted into kinetic energy, the movement of your legs which move the pedals which is transferred into mechanical energy which is transferred into kinetic energy, the movement of the bike**	Music box, windup radio or windup torch or any plug-in electric device	

18	Explain that many products are design to convert energy systematically to achieve an outcome as efficiently as possible. • **What type of energy does a battery contain? – potential chemical energy** The positive(cathode) and negative (anode) terminals on the battery are connected causing a chemical reaction with the electrolyte (the contents of the battery e.g. lithium but varies) so that electrons can flow between them creating electricity. • **What is the outcome of this transformation? – light energy (and depending on the type of bulb, some level of heat energy)** 🏆 **What happens in a 'disposable' battery after continued use? - Overtime, the electrodes and electrolytes become less reactive until they are exhausted** **How is a re-chargeable battery re-charged? – mains electricity is applied, and the process is run in reverse. This restores the properties of the electrodes and electrolytes so that they can generate electricity again** A good example of a re-chargeable battery is a car battery.	A battery powered torch which can be taken apart	
19	You might like to refer back to light bulbs to help explain energy loss: An incandescent bulb loses much of its energy through heat and so is less efficient than an LED bulb which gets far less hot. Explain that this also happens to human beings and animals: A running dog will get hot and so it pants to cool itself down however the act of panting uses energy so the dog will be less inclined to keep running! • **Does lost energy simply disappear? – the 'lost' energy doesn't actually disappear, it turns into other forms of energy for example heat, sound or light that are not usable** • **Why might it be seen as a bad sign if a car is very noisy or overheats regularly? – excessive heat or sound indicates a loss of energy is likely due to a drop in efficiency caused by a mechanical malfunction**	An incandescent bulb and an LED bulb with a lamp to demonstrate heat loss	

20	**Task 3** This slide can be used alone or in conjunction with the differentiated **worksheet** where children can write their answers in the table provided for recorded formative assessment. An example has been given to help children understand the activity. • **Ask children to identify the types of energy transformations that provide power for the items or actions pictured and ask them what the outcome will be – answer bubbles will appear one by one on the click of the mouse** Answers may vary in detail depending on the age group. At the end of the lesson you might like to leave children with the thought that the total amount of energy in existence in our universe remains the same. Energy is neither created or destroyed however as we have seen, energy can be transformed or converted and so the forms that energy takes are ever changing!	Any relevant product examples you feel may help with the exercise	Worksheet 1 Energy
21	**Task 4** This slide can be used as an **extension task**, alone or in conjunction with the differentiated worksheet where children can write their answers in the table provided for recorded formative assessment. • **Ask children to use the words in the list to fill in the gaps in the sentences – once you have gone through the task, the answers will appear one by one on the click of the mouse**	A battery powered torch which can be taken apart	Worksheet 1 Energy

22	**Plenary Quiz** - What have you learnt? This can be done as a quick-fire hands up quiz or pupils can be given time to write down their own answers for formative assessment. • **What type of energy is at play when you bounce on a trampoline? – Elastic energy** • **What name do we use for the energy of movement? – Kinetic energy** • **What type of energy does a battery have? – Potential chemical energy/chemical energy** • **What is meant by the term potential energy? – Having the possibility to develop into another type of energy for example chemical, mechanical, gravitational etc** • **What type of energy do we use to power or charge our devices? – Electrical energy** • **What other word do we use when one type of energy is converted into another? - Transformation**		
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