

## At the flick of a switch

### What's the science?

Sustainable electricity production raises challenges for scientists. We must strike a balance between the amount of electricity we produce and the environmental impact of producing it. Global warming has made the continued use of fossil fuels in electricity production unacceptable. Science needs to make electricity production affordable and 'clean' by making alternative methods of electricity generation widely achievable.

### What are scientists doing about it?

Scientists are looking at how to make the use of wind turbines more sustainable, including recycling the fibreglass blades of wind turbines in cement manufacture and using alternative, low-carbon materials for turbine blades – possibly even bamboo! New methods of separating photovoltaic cells from solar panels will allow for improved recycling. They are designing nuclear reactors that can reuse nuclear fuels. Chemists are also working towards producing 'solar fuels' by artificial photosynthesis.

### How could you explore this in the classroom?

- ▶ Ask learners to research through secondary sources the variety of ways electricity is generated. Ask them to record the positive and negative impacts that each method of generation may have. Look for similarities and differences in generation.
- ▶ Learners should discover that a turbine is often used in the electricity generation process. The turbine is turned either by the wind, a heated mixture of gases or, more frequently, steam. If fossil fuels are used to heat water for steam, by-products are produced which contribute to global warming or are damaging to health/the environment. Heating water using nuclear energy does not produce greenhouse gases, but radioactive waste is produced. Allow groups of learners to 'adopt' a generation method and ask them to use their literacy skills to present their findings to an audience. They could use ICT to create a presentation, write reports or create posters.
- ▶ In DT, learners could design/produce windmills or water wheels to run under a flow of water from a tap. They can use observation and data-recording skills to answer the question 'Do different designs spin more quickly?'

#### Curriculum links

Researching;  
comparing; planning;  
evaluating; observing;  
ICT; DT; numeracy

**Sources** [Creating fuel from thin air with artificial leaves | BBC](#) [Generating electricity | BBC Bitesize](#)  
[What is electricity? | BBC Bitesize](#) [How is electricity made? | YPTE \(Young People's Trust For the Environment\)](#) [Learn about water power | Energy Sparks](#)

## What's the science?

The Earth's resources are being used at an unsustainable rate. At the same time, human activity is driving global warming. One contributing factor is our energy usage. However we produce energy, it will always have an environmental impact – through burning fossil fuels, producing radioactive waste or the energy used in producing and maintaining 'clean' energies. Reducing demand for energy is key to reducing this impact.

## Who pays the bill?

## How could you explore this in the classroom?

- ▶ Discuss with learners some practical ways that everyone can contribute to reducing consumption. Then focus on school energy consumption. You could sign the school up to Giki zero to track steps taken in reducing energy consumption.
- ▶ Ask groups of learners to audit electricity usage for each classroom at school. This may involve designing questionnaires or using a plug-in electricity usage meter which gives a measurement of consumption by individual appliances. Examining the school smart meter will allow learners to investigate energy consumption by the school as a whole. They can identify wastage and use numeracy skills to present their findings.
- ▶ Discovering points of wastage should suggest ways of reducing energy consumption. Is there cavity wall insulation? Is there single or double glazing? Is the school's energy supplier reliant on fossil fuels? What can the school do differently? Groups can present their findings and recommendations to their class.
- ▶ Learners could make a presentation of their findings/recommendations to the wider school community. It could include video material as well as graphs and charts that the learners have produced.

## What are scientists doing about it?

Scientists are developing technologies to increase efficiency in energy production and help reduce demand for energy – the aim being to minimise environmental impact. Efficient boiler and machine designs aid the 'decarbonisation' of the environment. Blade design on wind turbines is constantly being refined, while photovoltaic cells are being improved. This allows for increased efficiency in energy 'harvesting' from nature. The rollout of smart meters helps consumers make choices about energy consumption.

### Curriculum links

Electricity; numeracy, ICT; researching using secondary sources; researching and presenting findings