

Chapter 3 **Power Stations, People and Climate Change.** **What are the links?**

Teacher notes and background information

- **Aims**
- **Background information**
- **Curriculum link**
- **Web Links**

This chapter aims to make children aware of how electricity is generated and that currently nearly 75 per cent of the United Kingdom's electricity is produced using coal, gas and oil, all of which are non renewable resources that when burnt release carbon dioxide and other gases into the atmosphere. Children will also recognise that the vast amounts of appliances and gadgets that we use every day are powered by electricity, and that increasing demand for electricity is leading to increased carbon dioxide emissions and therefore is directly related to global warming and climate change.

Learning intentions

- To understand the relationship between burning fuel in traditional power stations and carbon dioxide being released into the atmosphere
- To recognise that fuels such as coal and gas are burned to make electricity and that these are finite resources.
- To recognise that the amounts of carbon dioxide, created by human activity, released into the atmosphere has increased dramatically in the past 50 years
- To recognise that 'power' can be produced from renewable sources.

You may wish to extend the awareness of children that in the North West our quality of life has been determined by the legacy of the industrial revolution and its innovations. Not all communities in the world have access to the same improvements in the quality of life and that this raises a number of issues.

Background information

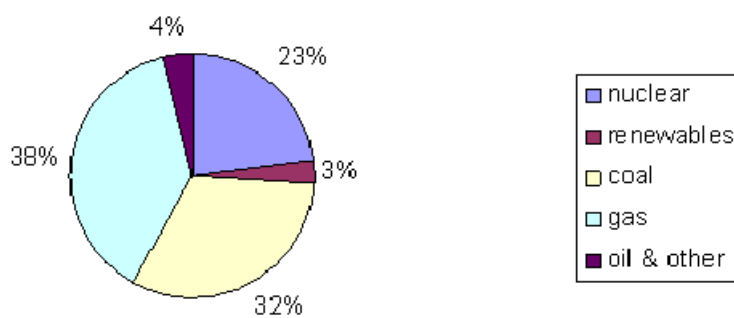
Electricity production and use

Electricity is often seen as clean power; however, the generation of increasing amounts of electricity to meet rising demand, results in huge amounts of carbon dioxide being released into the atmosphere. Traditionally electrical energy has been produced in power stations using fossil fuels such as coal, gas and oil or nuclear fuels.

<http://www.footprints-science.co.uk/power.htm> - How power stations work

Electrical energy is necessary for all industrialized societies to function, it is central to the maintenance of their standards of living, and it is essential to developing countries if they are to escape from poverty. The burning of coal, oil, and gas produces carbon dioxide and other gases that are harmful to the environment. The accumulation of carbon dioxide over the last few decades is responsible for increasing the Earth's surface temperature. There is scientific evidence that this global warming is resulting in climate change.

Electricity generation in the UK, 2002



Electricity can be generated by using renewable energy sources such as wind power, hydro (water power) and solar power. These renewable sources can generate electricity without producing carbon dioxide or any other atmospheric pollutants. Development of technologies that produce electricity in a sustainable way will continue to be a challenge in the future. Concerns about the effects of climate change are triggering the change from a world dependant on fossil fuels to one where sustainable electricity generation technologies are constantly being developed and refined.

Curriculum links

KS2 Science
Electricity
Unit 4F: Circuits and conductors
Unit 6G: Changing circuits (short unit)

KS2 PE
Dance activities

Web links

<http://www.unitedutilities.com/teachers/> Sustainable energy for teachers

www.carbondetectives.org.uk

<http://www.sustainablelearning.info>

<http://www.create.org.uk/>

<http://www.footprints-science.co.uk/power.htm> - How power stations work

<http://www.liverpoolictorial.co.uk/wirral/windturbines.html> - West Kirby and North Hoyle Offshore Wind Farm

Chapter 3 Power Stations, People and Climate Change.

What are the links?

This chapter aims to make children aware that our current standards of living are based on improvements over time and the availability of 'cheap power' from oil, coal and gas. It explores how electricity is generated and that currently nearly 75 per cent of the United Kingdom's electricity is produced using coal, gas and oil, all of which are non renewable resources that when burnt release carbon dioxide and other gases into the atmosphere. Children will also recognise that the vast amounts of appliances and gadgets that we use every day are powered by electricity, and that increasing demand for electricity is leading to increased carbon dioxide emissions and therefore is directly related to global warming and climate change.

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Activity guidance

Starter activity

Resources list

- What's the link? Photo sheets or displayed on Interactive whiteboard
- Interactive whiteboard or access to computers for viewing animation
- Paper and pencils

Show children the starter images page of power stations, pylons, wind turbines and electrical appliances. Ask the children about what links the images, why are they all together on one page?

Ask children to think about how electricity is made in a power station, by using this animation of a coal fired power station

<http://www.footprints-science.co.uk/flash/powerstation.swf>

This could be explored further in a dance or drama session exploring the working of a Power Station

- Coal arrives
- Coal burns in a furnace – **carbon dioxide is released**
- Water is heated to make steam
- Steam makes turbines turn
- Turbine makes the magnets turn which makes electricity
- The electricity is then distributed through a network of cables, pylons and transformer stations all around the country
- People plug in and switch on

Note: Children need to be made aware that burning of fossil fuels to generate electricity releases carbon dioxide into the atmosphere.

Activity 1 What do we use and when?

Resources list

- White boards and dry wipe pens
- Copies of Worksheet 3.1 and Worksheet 3.2
- Old catalogues
- Scissors
- Glue sticks

This activity encourages children to consider where and when they use electricity

Working with a partner children write down as many things as they can think of that use electricity

Children are given either worksheet 3.1 summer or sheet 3.2 winter (may be best photocopied A3 size). Both sheets show a circle divided into quarters, the circle represents a 24 hour clock. Children work in pairs to draw, write or cut and stick pictures from catalogues in the correct quarters to show what electrical equipment they use at different times of day, they can include electrical equipment used at school if you are considering a school day.

As a whole class children present their findings about when and where they use electricity, noting peak times for electricity use and the differences between electricity use in summer and winter.

Children to consider their electricity usage and how they could change their behaviour to use less electricity.

Children also consider that the way electricity is generated needs to change so that less carbon dioxide and other gases are released into the atmosphere, revisit sustainable energy sources such as wind turbines, hydroelectricity etc.

Activity 2 Hidden Electricity

Resources list

- a range of products, enough for 2 per group for example: a tin of Heinz beans, a loaf of Warburtons bread, a packet of McVities biscuits
- photographs of a variety of products (adverts in magazines are a good source)
- Large sheets of paper
- Coloured pens
- Question prompt sheets – 1 per group
- Plenary - What's the link? photo sheet

Electricity has been used to manufacture many of the products we buy and use every day from food items to newspapers. This activity encourages children to think about the hidden electricity that has been consumed during the manufacture of products they use. This will make them more aware of how it is not only direct electricity usage that has to be considered when looking at increases in demand for electricity but how manufacturers produce, package and transport

good that we use or consume on a daily basis. You will need to collect a range of products, for example: a tin of Heinz beans, a loaf of Warburtons bread, a packet of McVities biscuits and / or photographs of a variety of products (adverts in magazines are a good source)

Children to work in groups, each group to be given a product or photograph, a large sheet of paper, the question prompt sheet and a pen.

Consider the product, discuss and write answers to the prompt questions:

- What is it you product?
- How is it packaged?
- What is the packaging made out of?
- Do you know anything about how the packaging might have been made?
- Is the product made of lots of parts or ingredients?
- Has the product or any of it's parts been heated or cooked?
- Think about where electricity might have been used to make the product

Plenary - discussion

Children are given the 'What is the link?' photo sheet. Ask them to think about what links the three photographs together.

When they have established a link children then need to consider some ideas about and solutions to the issues they have raised, these may include:

- Sustainable electricity generation
- Rethinking design of products and how they are made
- Changes in culture to more sustainable living practices

An answer sheet is provided to assist teachers with the discussion.

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What's the link?

Plenary answer sheet



What are the links?



Links:

- Burning coal in a coal fired power station makes carbon dioxide
- Increasing use of electrical gadgets leads to increased demand for electricity thus more coal must be burnt releasing more carbon dioxide into the atmosphere
- Carbon dioxide is one of the gases that is contributing to global warming.
- Global warming is causing polar ice to melt, this threatens the habitats of animals such as the polar bear.

Coal fired power station

Possible Solutions:

- Replace coal fired power stations with renewable power sources such as wind, water, wave, solar power.
- Replace coal fired power stations with nuclear power stations which do not release carbon dioxide when generating electricity but do have other environmental problems associated both the positioning and building of the power station and with the disposal of nuclear fuel
- Make electrical gadgets more efficient so that they use less electricity
- Encourage a culture where electrical are always switched off fully when not in use

Increasing use of electrical gadgets



Consider some solutions?

Melting Arctic ice, stranded Polar Bears

Acknowledgements Chapter 3

Photographs sourced from www.flickr.com

Polar bear	by Alistair Rae
Coal fired power station	by jimd2007
Pylon	by psychbird
Wind Turbine	by ulleskelf
Nuclear power station	by dpicker
TV	by show3
Green lamp	by Born under a bad song
Beans	by CaroWallis1

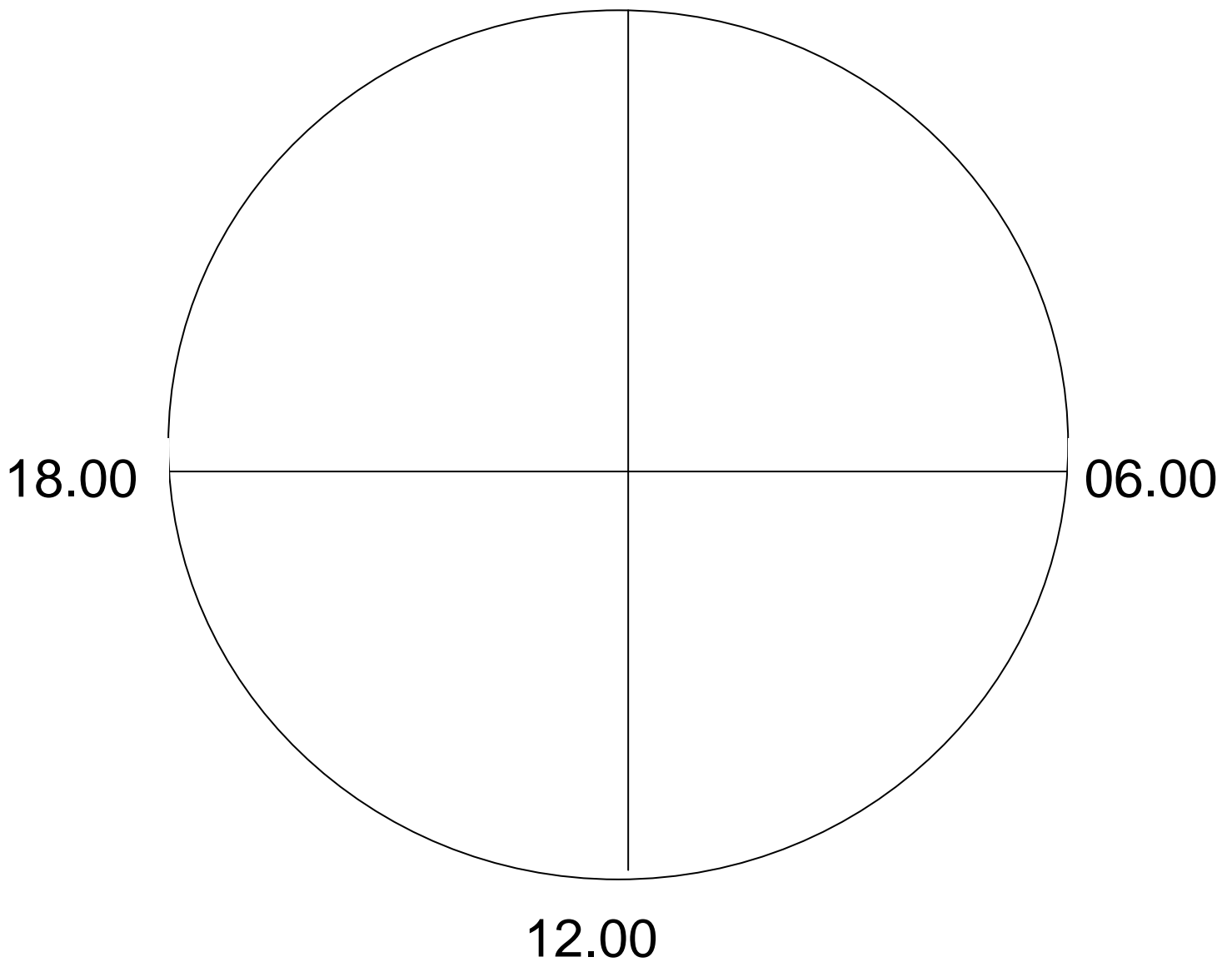
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Worksheet 3.2

When and What
do you switch on and off?

In winter...

0.00



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Activity 2 - Prompts

How is it packaged?

What is the packaging made out of?

Do you know anything about how the packaging might have been made?

Is the product made of lots of parts or ingredients?

List some of the different parts or ingredients.

Are any of the ingredients grown in different parts of the world?

Has the product, or any of its part, been heated or cooked?

Think about where electricity might have been used to make the product.

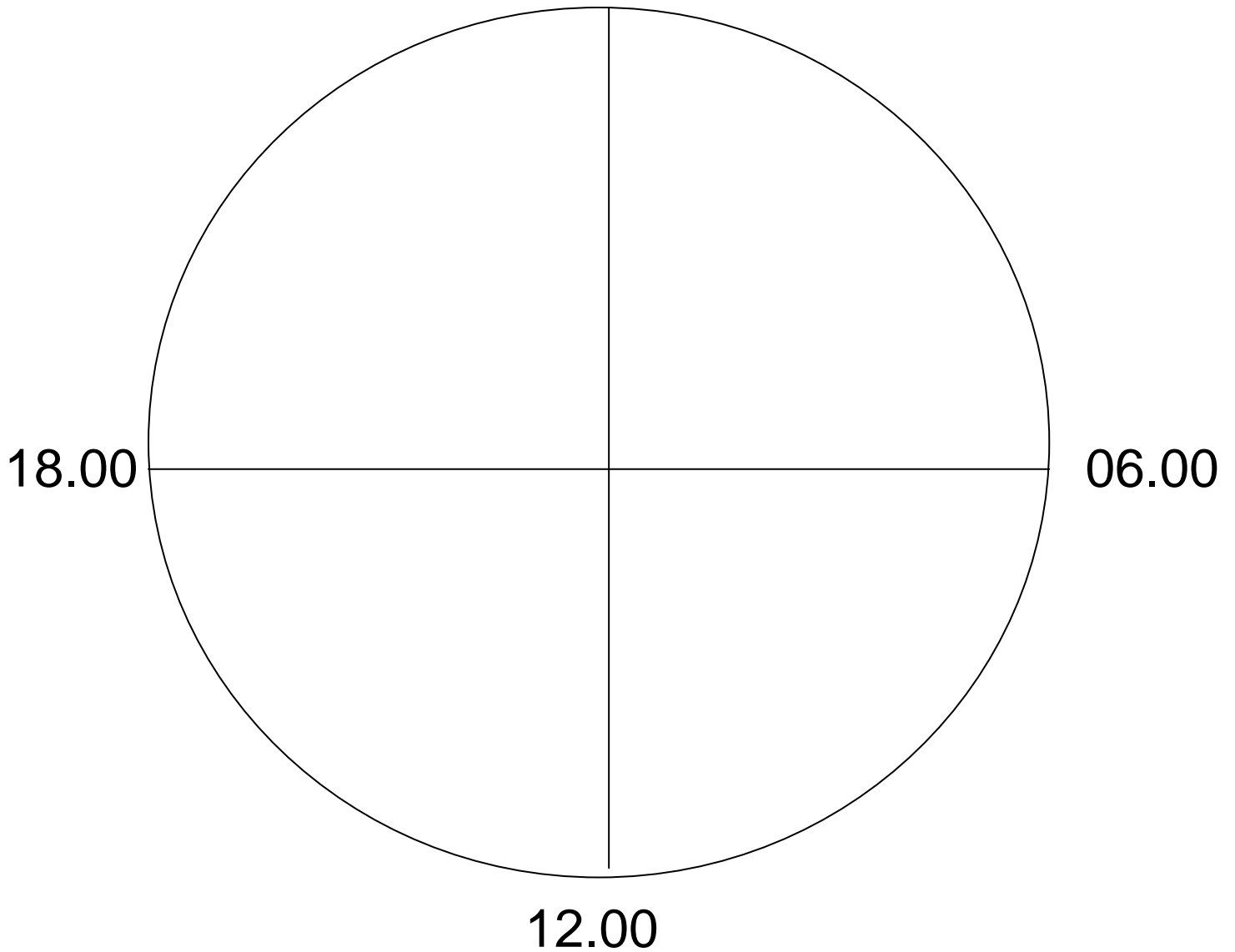
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Worksheet 3.1

When and what
do you switch on and off?

In summer...

0.00



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Plenary Activity

What are the links ?



Coal fired power station



Increasing Use of Electrical Gadgets



Melting Arctic ice, stranded Polar Bears

Consider some solutions?

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Starter Activity



What are the links?

