

P1

Part 2

Electrical energy and waves

AQA specification match

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Course catch-up	
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Why study this unit?

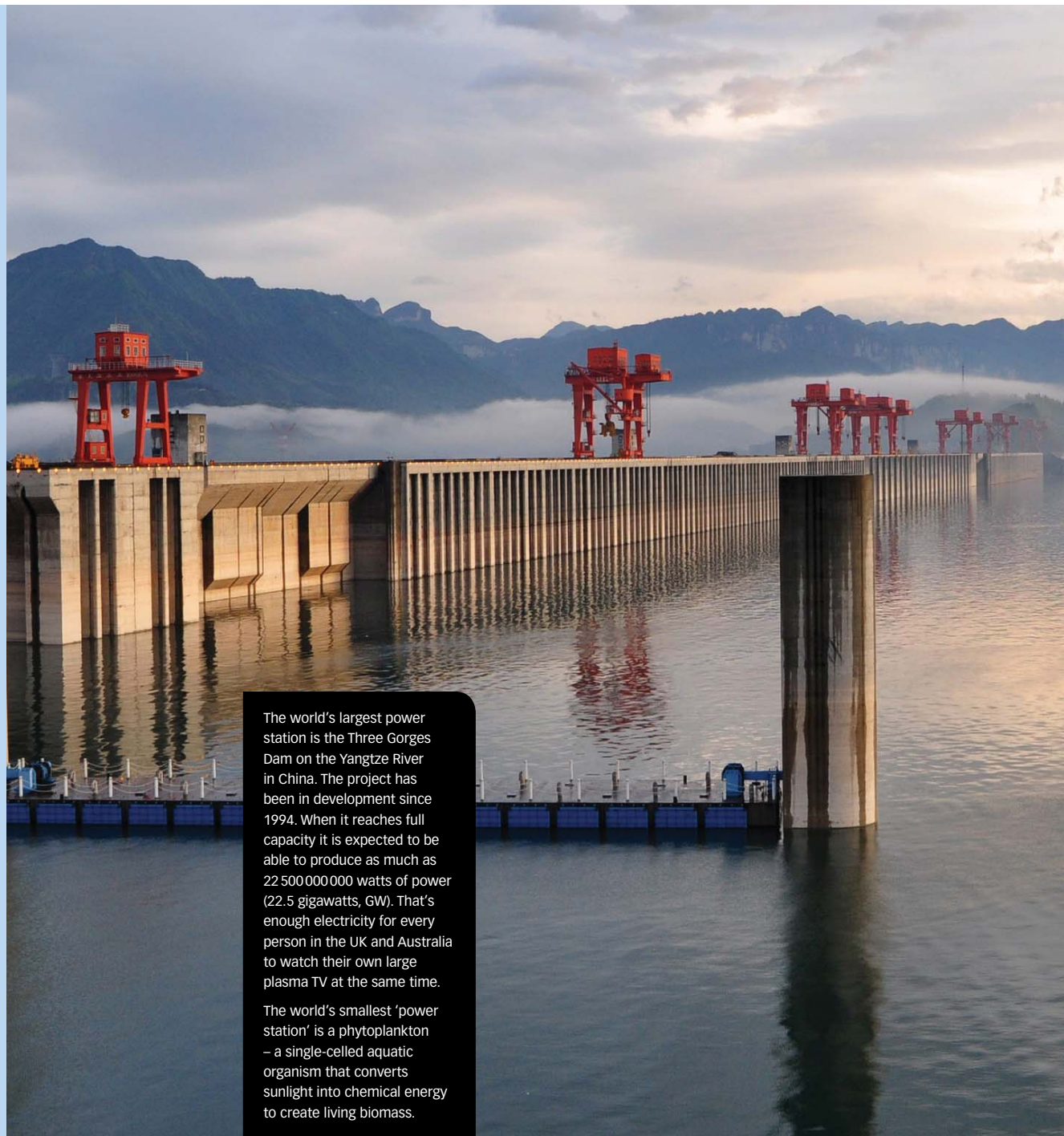
Human activity is leading to changes in climate, and we are rapidly using up our natural resources. Scientists are working on solutions to these problems. We consume vast amounts of electricity every day, powering a range of appliances including our TVs and computers. In the future, how will we generate enough to meet our needs?

In this unit you will learn about how electricity is generated, and the advantages and disadvantages of the different technologies, from large coal-fired power stations to small solar cells on calculators.

You will also learn more about waves. How, when we talk, our mobile phones convert sound waves into microwaves before beaming them at high speed to the nearest mobile phone mast. Finally, you will learn about how electromagnetic waves provide the evidence for the Big Bang theory. This is one of the most important of scientific ideas; it describes how everything around us, the entire Universe, was formed.

You should remember

- 1 All human activity has an impact on the environment.
- 2 The conservation of energy states that energy cannot be created or destroyed.
- 3 Electricity is generated in different types of power station.
- 4 Waves, like light and sound, transfer energy from one place to another.
- 5 Light and sound can be reflected off objects, and refracted when they travel from one material to another.



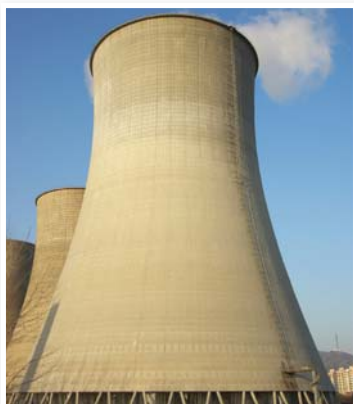
The world's largest power station is the Three Gorges Dam on the Yangtze River in China. The project has been in development since 1994. When it reaches full capacity it is expected to be able to produce as much as 22 500 000 000 watts of power (22.5 gigawatts, GW). That's enough electricity for every person in the UK and Australia to watch their own large plasma TV at the same time.

The world's smallest 'power station' is a phytoplankton – a single-celled aquatic organism that converts sunlight into chemical energy to create living biomass.

Learning objectives

After studying this topic, you should be able to:

- ✓ explain that, in some power stations, fuel is used to heat water to produce steam
- ✓ describe how steam drives a turbine connected to a generator
- ✓ describe how naturally occurring steam can be used to drive turbines



▲ A cooling tower at a power station

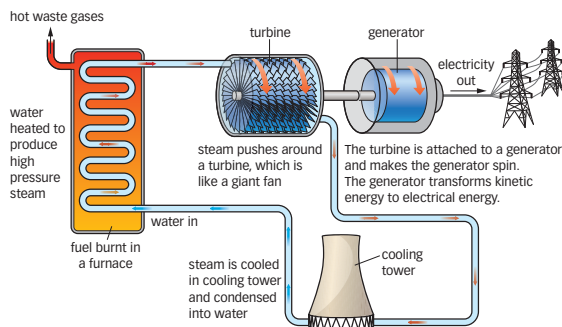
Did you know...?

The shape of cooling towers helps to set up a natural convection current. Cool air is drawn in at the base and flows over radiators. Heat from the steam is transferred to the air.

A Why is electricity not a source of energy?

Generating electricity

Electricity is generated using sources of energy. A great deal of the electricity in the UK is generated by using an energy source to heat water. The energy source can be **fossil fuels**, biomass or the Sun. This type of power station is called a **thermal power station**.



▲ A conventional power station where an energy source is used to heat water



▲ A turbine in a power station being repaired. The turbine is about 5 m across

Geothermal power

In some parts of the world, such as Iceland, where there are volcanic areas, **geothermal** energy can be used to **generate** electricity.

Steam rises to the surface of the Earth, or is not far below it. The steam can be collected and piped to a power station to drive the **turbines** directly.

Geothermal energy does not have any fuel costs, but money is spent on building the power station and maintaining it. These power stations can also be started up and stopped relatively easily.

Geothermal energy can also be used to heat houses. In Iceland, the waste steam from a geothermal power station is piped to houses to heat them. Boreholes can also be drilled into the ground to collect the steam.



▲ In New Zealand, boreholes are drilled into the ground to collect the steam

B What is geothermal energy?

Key words

fossil fuel, thermal power station, geothermal power, generator, turbine

Exam tip**AQA**

- ✓ Remember that electricity is not a source of energy, but is a form of energy.

Questions

- 1 What are the differences between a conventional power station and a geothermal power station? **S**
- 2 What does the turbine do? **M**
- 3 What does the generator do? **M**
- 4 What is the function of the cooling towers? **H**
- 5 Draw a flow diagram to show all of the energy transfers taking place in a conventional power station. **H**