

Energy Sources and their Trends in their Uses 1

Q:1 There is an increasing demand for electricity and the reserve of fossil fuels is decreasing. A way to meet increasing demand for electricity is to build new nuclear power stations. Some people feel that no new nuclear power stations should be built because of the risks associated with nuclear fuels.

(a) Outline the arguments that a scientist working in the nuclear power industry could use to justify the building of more nuclear power stations in the future.

(3 marks)

(b) Nuclear waste is a problem that must be dealt with. One possible solution would be to bury the waste deep underground.

Suggest one reason why some people are against burying nuclear waste.

(1 mark)

(c) Electricity can also be generated using renewable energy sources. Look at this information from a newspaper report.

- z The energy from burning bio-fuels, such as woodchip and straw, can be used to generate electricity.
- z Plants for bio-fuels use up carbon dioxide as they grow.
- z Farmers get grants to grow plants for bio-fuels.
- z Electricity generated from bio-fuels can be sold at a higher price than electricity generated from burning fossil fuels.
- z Growing plants for bio-fuels offers new opportunities for rural communities.

Suggest why, apart from the declining reserves of fossil fuels, power companies should use more bio-fuels and less fossil fuels to generate electricity.

(3 marks)

Q:2(a) Water waves are a renewable energy source.

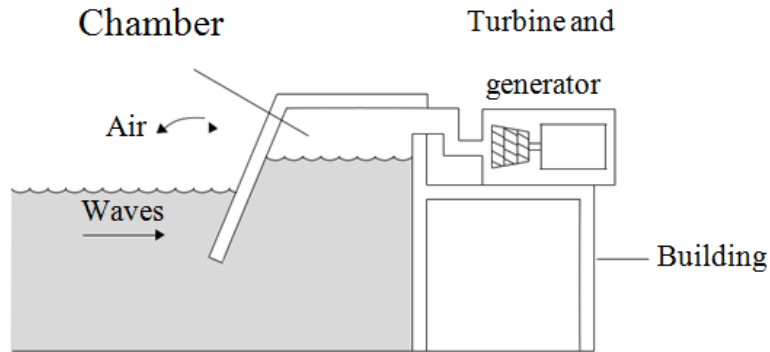
The government wants more electricity to be generated from renewable energy sources.

Some people do not think this is a good idea.

What reasons could a government scientist give to show people that using more renewable energy sources is a good idea?

(2 marks)

(b)The diagram shows a wave-powered generator. The generator transforms kinetic energy from the waves to electrical energy.



The following sentences describe how the wave generator works. The sentences are in the wrong order.

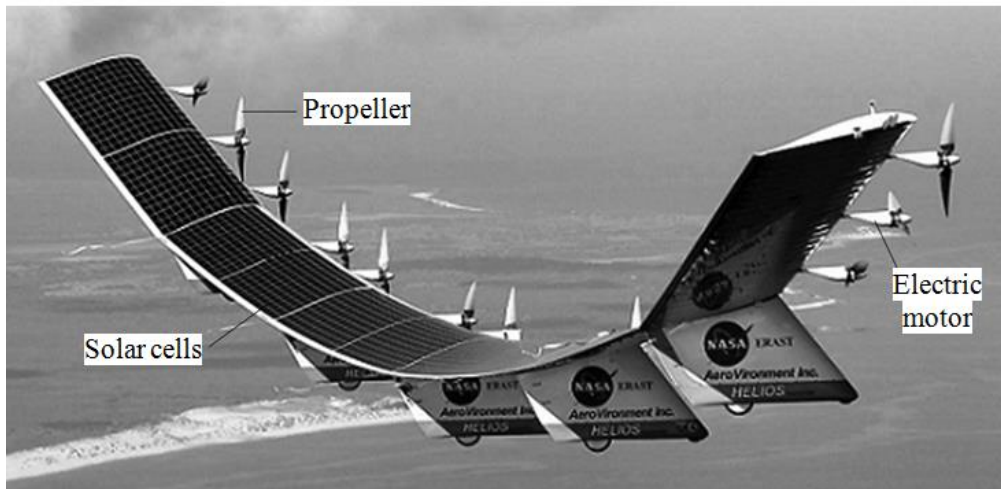
- R Waves push air up and down a chamber inside the building.
- S The turbine turns the generator.
- T The generator transforms kinetic energy to electrical energy.
- U The air rushes through a turbine making it spin.
- V Strong waves move towards the wave-powered generator.

Arrange these sentences in the correct order. Start with letter V.

V → → → →

(3 marks)

Q:3 The picture shows a solar-powered aircraft. The aircraft has no pilot.



The aircraft propellers are driven by electric motors. As well as the solar cells, there are fuel cells that provide additional power to the electric motors.

(a) Suggest one advantage of the aircraft having fuel cells as well as the solar cells.

(1 mark)

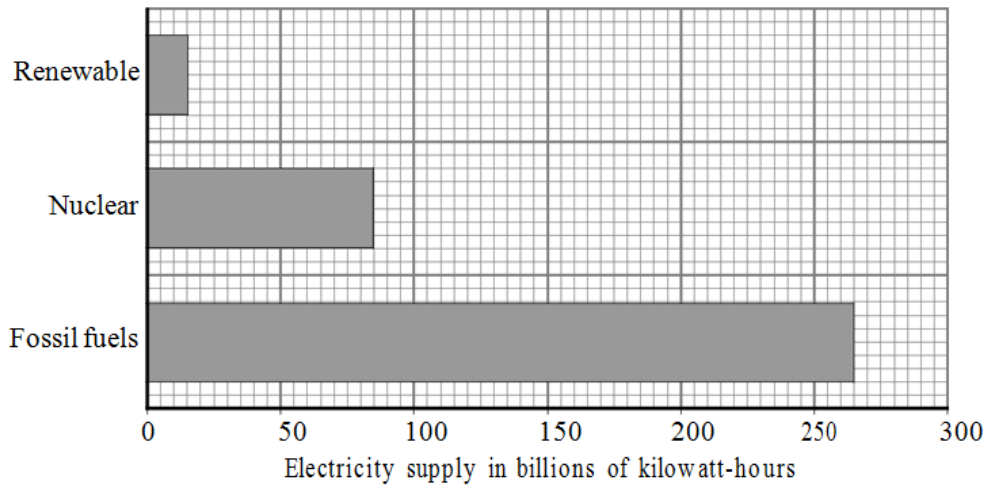
(b) Give one environmental advantage of using electric motors to drive the aircraft propellers rather than motors that burn a fuel.

(1 mark)

(c) Eventually, the designers want to produce an unmanned aircraft that can fly at twice the height of a passenger jet for up to six months. Suggest one possible use for an aircraft such as this.

(1 mark)

Q:4 The bar chart shows the different energy sources used to generate the UK's electricity in 2007.



(a)(i) The wind is a renewable energy source. Name one more renewable energy source used to generate electricity.

(1 mark)

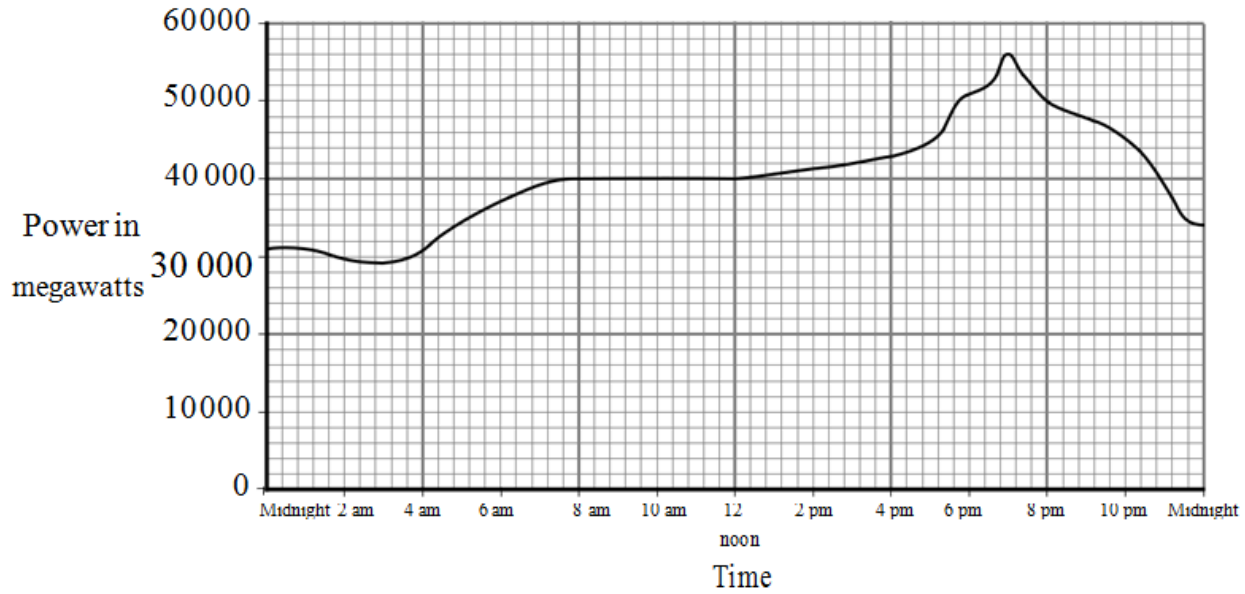
(a)(ii) Complete the following sentence by drawing a ring around the correct line in the box.

Using less fossil fuels to generate electricity will the amount of carbon dioxide emitted into the atmosphere.

decrease
increase

(1 mark)

(b) The graph shows how the demand for electricity in the UK varied over one day in the winter.



(b)(i) Describe how the demand for electricity varied between 4.00 am and 10.00 am.

(2 marks)

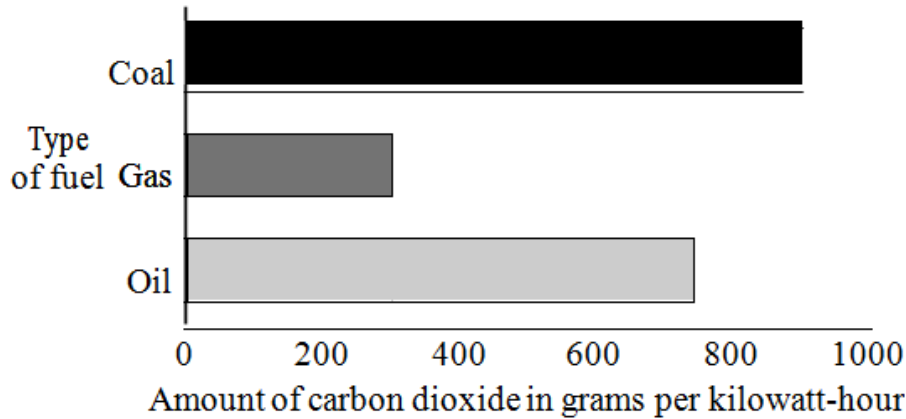
(b)(ii) Which type of power station has the fastest start-up time? Draw a ring around your answer.

coal natural gas nuclear oil

(1 mark)

Q:5 (a) Most electricity in the UK is generated in power stations that burn fossil fuels.

The bar chart shows how much carbon dioxide is produced for each kilowatt-hour of electricity generated using a fossil fuel.



(a) (i) Which fossil fuel produces the smallest amount of carbon dioxide for each kilowatt-hour of electricity generated?

(1 mark)

(a) (ii) Which one of the following statements gives the reason why the data has been shown as a bar chart and not as a line graph?

Put a tick (☑) in the box next to your answer.

Both variables are categoric.

Both variables are continuous.

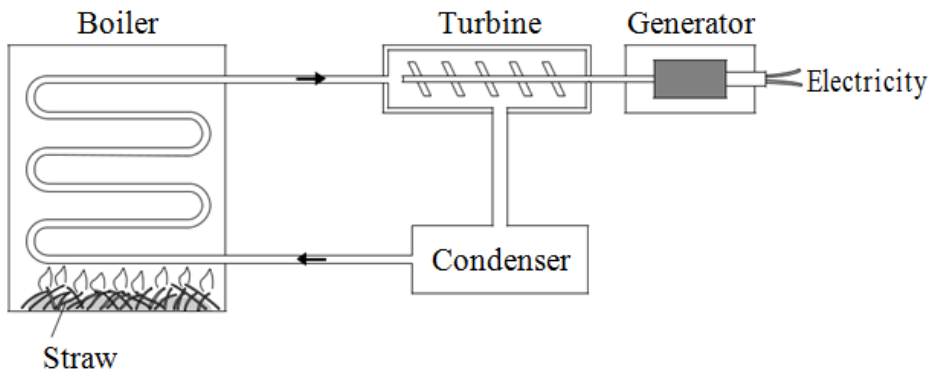
One variable is categoric, the other is continuous.

(1 mark)

(a)(iii) Why does a nuclear power station not produce any carbon dioxide?

(1 mark)

(b) Some types of power station generate electricity by burning straw.



(b)(i) Use words from the box to complete the following sentences.

boiler gas generator steam turbine water

Straw is burned in a _____ Water is heated to make _____ which is used to drive a _____ This turns a _____ to produce electricity.

(4 marks)

(b)(ii) Straw is a type of renewable energy source known as a biofuel.

Name one other type of renewable energy source used to produce electricity.

(1 mark)

(b) (iii) A power station generates 36 000 000 watts (36 MW) of electrical power by burning straw. The average power used in each home in the UK over one year is 2000 watts.

Calculate the number of homes that the power station could supply electricity to.

Show clearly how you work out your answer.

Number of homes = _____

(2 marks)

Q:6 Over the next 15 years, some of the older nuclear power stations will be closed down, and the process of decommissioning will start. In the same period, several countries plan to build a number of new nuclear power stations.

(a)(i) What does it mean to decommission a nuclear power station?

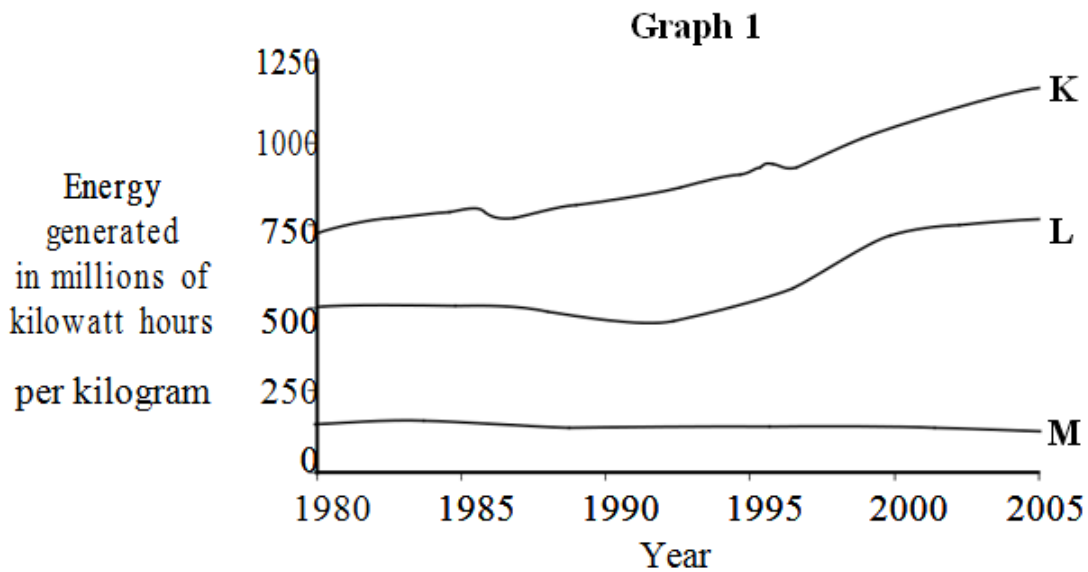
(1 mark)

(a)(ii) How does decommissioning affect the overall cost of electricity generated using nuclear fuels?

(1 mark)

(b) Uranium is a fuel used in nuclear power stations to generate electricity.

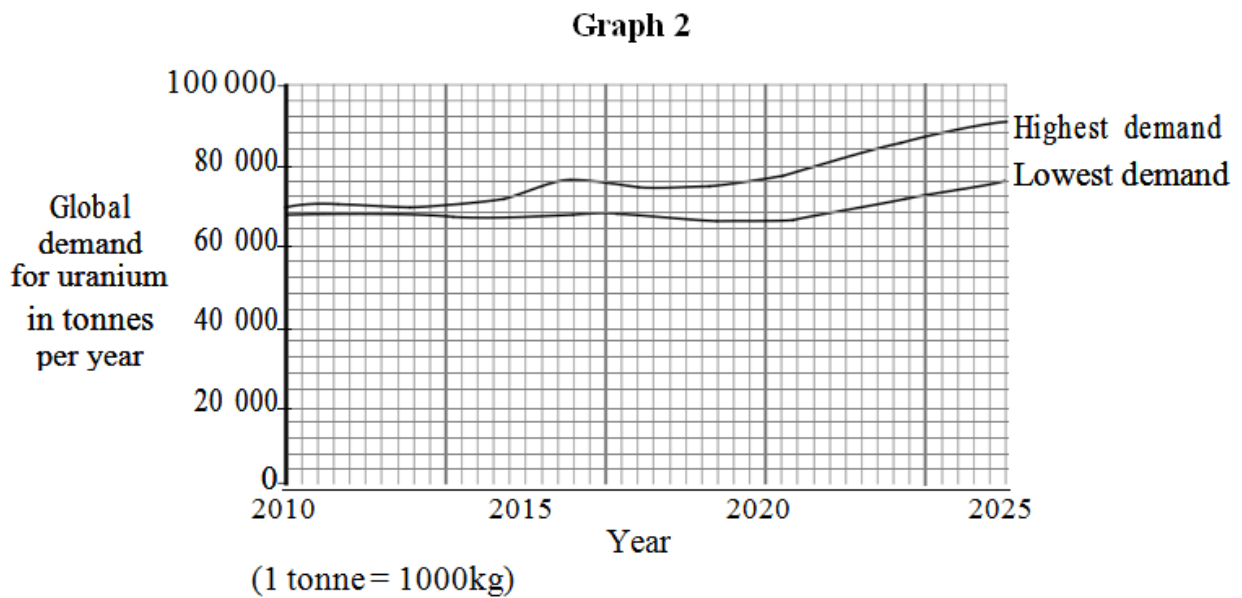
Graph 1 compares how the electricity generated from one kilogram of nuclear fuel changed between 1980 and 2005 in three different types of nuclear power station.



(b) (i) Compare the efficiency of the three types of power station, K, L and M, between 1980 and 2005.

(2 marks)

Graph 2 shows two different predictions for the global growth in uranium demand over the next 15 years.



(b) (ii) Suggest reasons why it is not possible to predict accurately how much uranium will be needed in 2025.

(2 marks)

TOTAL MARKS=36