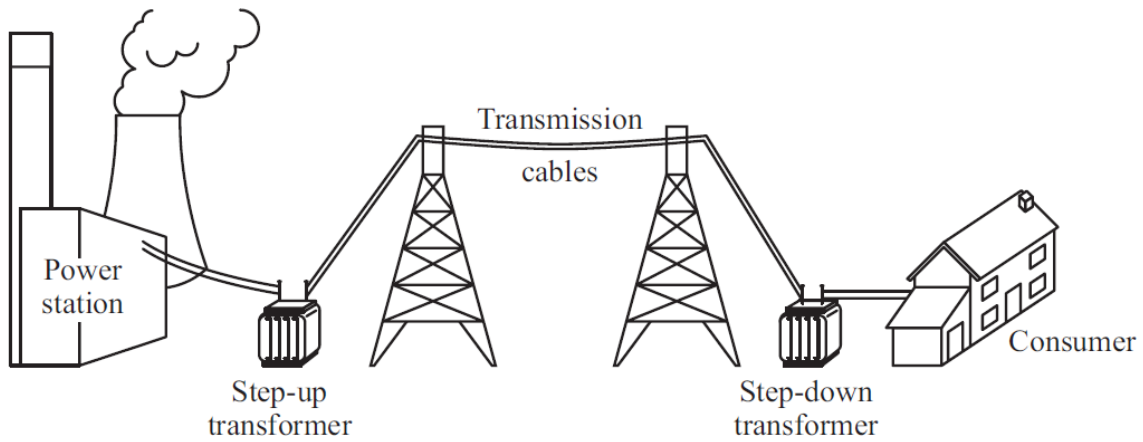


Energy Sources and Power Stations

1.

The diagram shows how electricity is distributed from power stations to consumers.



- (a) (i) What name is given to the network of cables and transformers that links power stations to consumers?

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(1 mark)

- (ii) What does a step-up transformer do?

.....
(1 mark)

- (iii) Explain why step-up transformers are used in the electricity distribution system.

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(2 marks)

- (b) Most of the world's electricity is generated in power stations that burn fossil fuels.

State **one** environmental problem that burning fossil fuels produces.

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(1 mark)

- (c) Electricity can be generated using energy from the wind. A company wants to build a new wind farm. Not everyone thinks that this is a good idea.



- (i) What arguments could the company give to persuade people that a wind farm is a good idea?

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(2 marks)

- (ii) What reasons may be given by the people who think that wind farms are **not** a good idea?

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(2 marks)

2.

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.

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(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.

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.....

(1 mark)

- (c) Electricity can also be generated using renewable energy sources.

Look at this information from a newspaper report.

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

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(3 marks)

3.

(a) Solar energy is a *renewable* energy source that can be used to generate electricity.

(a) (i) What is meant by an energy source being *renewable*?

.....

(1 mark)

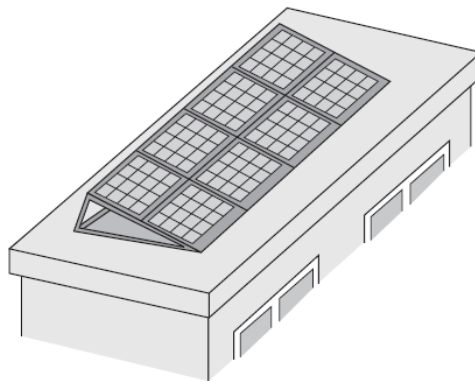
(a) (ii) Name **two** further renewable energy sources used to generate electricity.

1

2

(1 mark)

(b) A householder uses a bank of solar cells to generate electricity for his home. The solar cells are tilted to receive the maximum energy input from the Sun.



The data in the table gives the average energy input each second (in J/s), to a 1 m² area of solar cells for different angles of tilt and different months of the year.

Month	Angle of tilt			
	20°	30°	40°	50°
February	460	500	480	440
April	600	620	610	600
June	710	720	680	640
August	640	660	640	580
October	480	520	500	460
December	400	440	420	410

- (b) (i) Use the data in the table to describe how the average energy input to the solar cells depends on the angle of tilt.

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(2 marks)

- (b) (ii) The bank of solar cells used by the householder has an area of 8 m².

The efficiency of the solar cells is 0.15

Use the equation in the box to calculate the average **maximum** electrical energy available from the bank of solar cells each second in June.

$\text{efficiency} = \frac{\text{useful energy transferred by the device}}{\text{total energy supplied to the device}}$

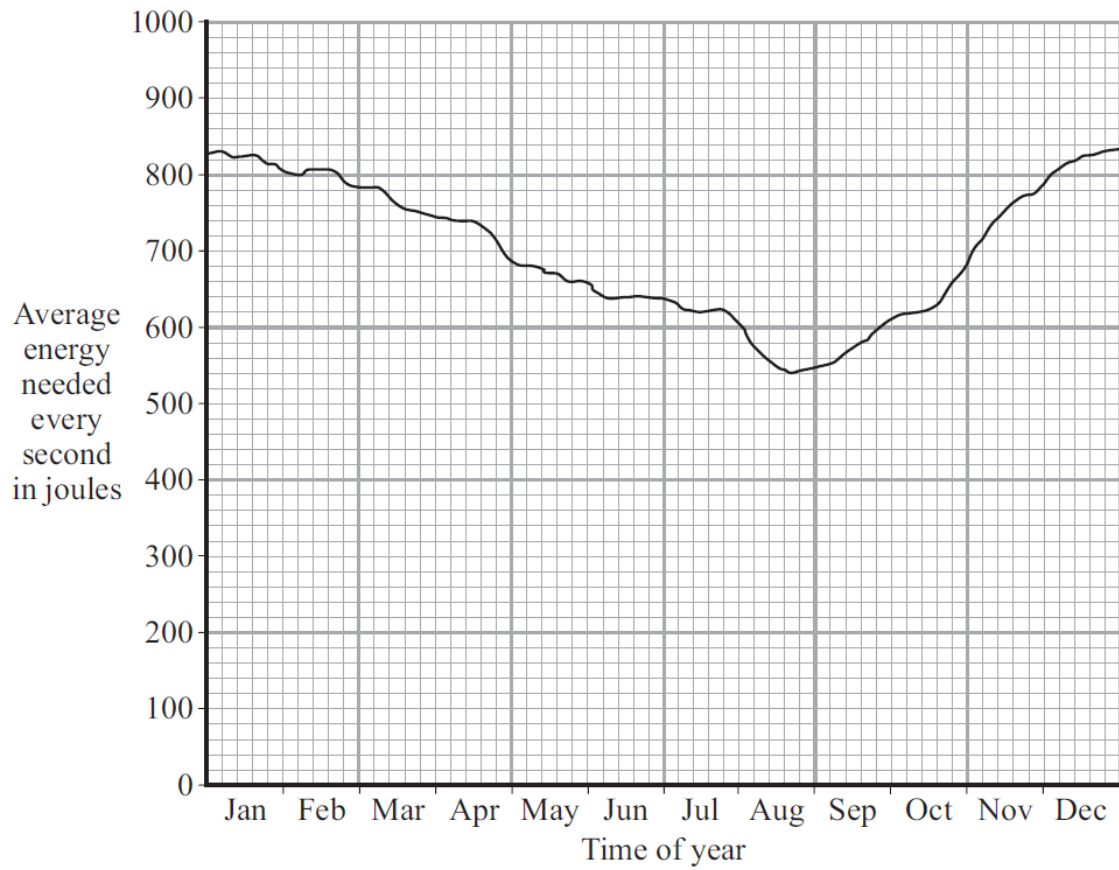
Show clearly how you work out your answer.

.....

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Maximum energy = joules/second
(3 marks)

(c) The graph shows how the householder's electrical energy needs change over one year.



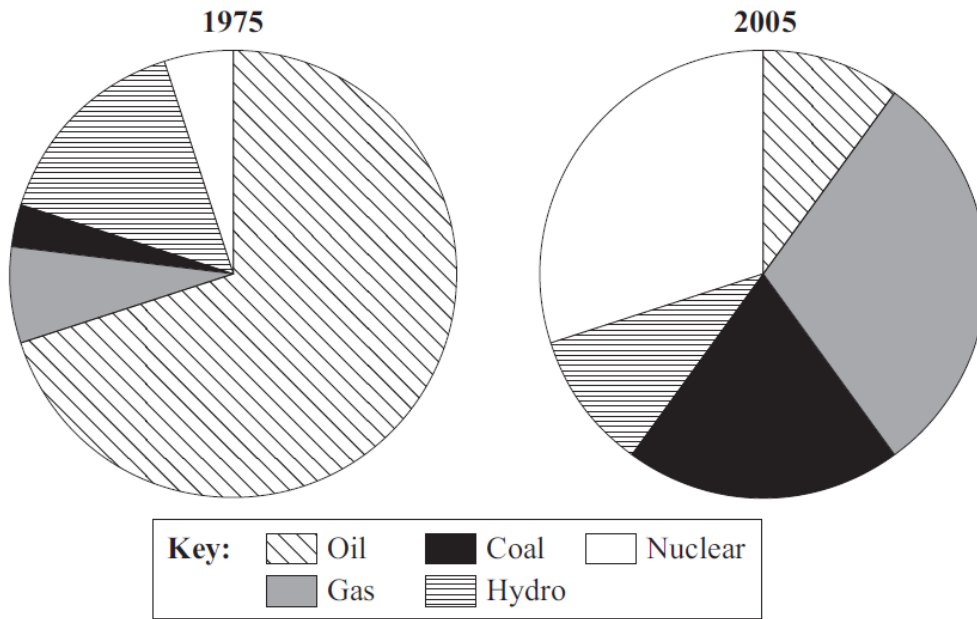
Why would it be advisable for the householder to remain connected to the National Grid?

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(1 mark)

4.

The pie charts show the relative proportions of electricity generated in Japan from different energy sources in 1975 and 2005.



(a) Describe the main differences in the energy sources used in 2005 compared with 1975.

.....
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(1 mark)

(b) In the UK, nuclear fuels are used to generate about 21% of the total electricity supply.

(b) (i) What is the name of the process by which a nuclear fuel produces heat?

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(1 mark)

(b) (ii) Explain how the heat released from a nuclear fuel is used to generate electricity in power stations.

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(2 marks)

- (b) (iii) Some people have suggested that more nuclear power stations should be built in the UK.

Give **two** reasons to support this suggestion.

1

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2

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(2 marks)

- (b) (iv) Nuclear power stations create dangerous waste.

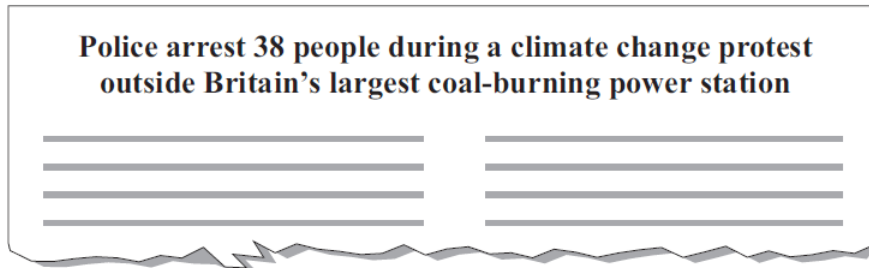
Why is the waste from a nuclear power station dangerous?

.....

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(1 mark)

- (c) A headline from a newspaper article is shown below.



Explain the possible link between *climate change* and *coal-burning power stations*.

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(2 marks)