

SOURCES, GENERATION AND STORAGE OF ENERGY

Energy comes from a range of renewable and non-renewable sources

Non renewable energy sources. (Finite Resources)



COAL

Coal has been 'blamed' for a range of pollutants, that are released into the air we breathe. CO2 is emitted from power stations in large volumes (billions of tonnes) each year and this contributes significantly to poor air quality, but also to global warming.



OIL

Oil is burnt to heat water to make steam, which turns turbine blades, to make electricity. Makes petrol, paraffin, diesel. Used to make plastics. Cheap to extract & convert. Highly polluting. Risks environmental disaster while being transported. Impacts wildlife.



GAS

Powers turbines. Used at home for cooking/heating. Less emissions than coal and oil. Stable, large scale and high power electricity generation. Cheaper to convert. Ready made fuel. Cleaner than coal & oil but burning gases are highly polluting.

Non-renewable energy sources are fossil fuels that were formed from the remains of animals and plants that lived millions of years ago.

They cannot be replenished quickly, and will run out, probably within your lifetime.

ENVIRONMENTAL IMPACT

- Fossil fuel emissions
- Destruction of habitats and landscapes
- Sound pollution
- Appearance
- Transport of fuels / waste
- Waste disposal



Renewable energy sources. (non-finite resources)

Renewable energy sources use natural energy to make electricity. Renewable energy sources produce 20 per cent of the UK's electricity and are important for reducing carbon emissions.



WIND

Wind turbines use propeller blades, which spin a shaft in a generator, to create electricity. No emissions. Can be used in remote areas. Could restrict shipping if in the sea. Wind might drop. Unsightly. Expensive to set up.



BIO-MASS

Organic matter from organisms: wood, crops, rubbish, landfill gases and alcohol fuels. Used to produce heat and convert to electricity via burning. Large areas needed to cultivate crops. No harmful chemicals. Leads to deforestation.

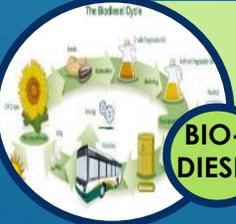
Photovoltaic panels convert sunlight into energy. They heat a liquid, producing steam, which is converted into mechanical energy in a turbine, which creates electricity. Reliable in hot countries. Homes can have their own electricity supply. Could change landscape and ecology. Expensive to set up.

SOLAR



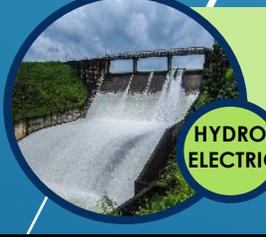
Turbines generate electricity from movement of tidal water. Artificial tidal barrage are used in rivers, bays and estuaries. Powerful, no emissions, stable source. But ... lower energy output, expensive. Only available in coastal areas.

TIDAL



BIO-DIESEL

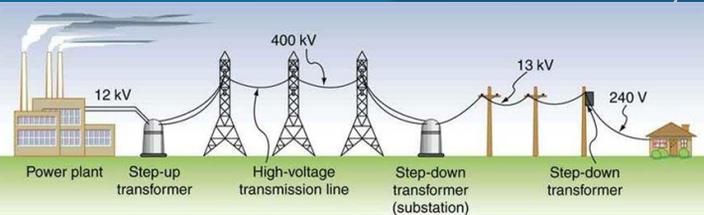
Organic matter..plants, vegetables, waste cooking oil. Can be used in diesel engines without engine modification. No harmful emissions. Large areas needed to cultivate crops. Leads to deforestation.



HYDRO-ELECTRIC

Dams trap water and force it through tunnels. This turns turbines, creating electricity. Low cost power. Can also be used to reserve water. Expensive to build. May damage local ecology. Habitat destruction .

Storage of energy



On a national grid level, supply must meet demand. Power supply companies continually make adjustments to satisfy demand. At certain times of the day there is a surge in electricity use. Storms and equipment overloads can cause power cuts. Unused electricity must be stored for future use. This can be in a variety of formats which are then used to power systems. Mostly uses finite resources but is using more and more renewables.

EVALUATING NEW AND EMERGING TECHNOLOGIES TO INFORM DECISIONSCORE 1.3 **1**

1. Explain why coal may be used to provide energy for a hospital, rather than solar energy.
- _____
- _____
- _____
- (2 marks)
2. Give one benefit of developing electric vehicles.
- _____
- _____
- (1 mark)
3. Explain why wind power is an unreliable energy source.
- _____
- (1 mark)
4. Name 3 environmental impacts of finite energy sources
- 1 _____
- 2 _____
- 3 _____
- (3 marks)
5. How is hydro-electricity created?
- _____
- _____
- (2 marks)
6. We live on an island. Give 2 reasons why we are not taking advantage of tidal power. After all, it is a very reliable energy source.
- Reason 1: _____
- Reason 2: _____
- (2 marks)
7. Out of the 3 non-renewable sources, which do you think is best?
- Explain your answer: _____
- _____
- (2 marks)
8. What is a finite energy resource?
- _____
- (1 mark)
9. Why do you think there is a spike in electricity usage after a popular TV programme has finished?
- (1 mark)

POWER SYSTEMS

A power system is a network of components that supply, transfer and use electricity. Some examples:

Batteries

Use chemical energy. 2 terminals : positive (+) & negative (-). Chemical reaction produces electrons that allow a current to flow through a circuit. Expensive.

Batteries contain toxic chemicals that can harm the environment. Therefore, it is important that they are recycled or disposed of correctly.

Eg.: Cylindrical cells, D,C, A,AA,AAA. Easy to make. Stable supply. Found in medical implants, toys, car keys, TV remotes.



Eg: prismatic cells. Flexible. Expensive. Easy to recharge, but shorter life than cylindrical batteries. Found in mobile phones, digital cameras, tablets,laptops.



Electronic devices such as laptops, can be made more eco-friendly with more energy-efficient batteries.

Wind Power

Converts wind into electricity. A group of wind turbines (wind farm) can produce a lot of electricity, but is dependent on wind.

Mains Electricity

Supplied from power stations through National Grid. AC flows in one direction 50 times a sec. Mains electricity in home = 230V. Items need to be plugged in. Demand fluctuates, so it needs to be storable, ready for spikes / surges in demand.

Eg.: kettles, fridge, hairdryers, TVs, radios, chargers, lamps, amps computers lawn mowers, microwaves



Solar Cells

Turn sunlight into electricity. 2 layers of silicon treated to allow electrons to flow in sunlight.Free energy once set up costs are recovered. Can sell excess electricity to national grid. Unsightly. Affects landscape. Non-polluting.

Eg.: solar panels (photovoltaic cells) on house roofs to provide household electricity; solar farms to create electricity on a larger scale. Small, thin, low voltage solar cells can be used for project work in schools, security lighting, garden lighting etc..



Choosing Appropriate Energy Sources for Products and Power Systems

Systems can be powered in different ways and need to be selected for the job. Designers need to consider the following:

1.Portability

Remote working requires access to phones, computers etc. with a power source that doesn't need to be plugged in. These devices need to be portable and compact.



2. Environmental Impact

There is no such thing as an entirely clean energy source. Fossil fuels emissions pollute the atmosphere. Habitats can be destroyed when extracting or setting up facilities. Lorries transporting fuel also pollute the air with diesel emissions. Landfill sites pollute the ground and give off emissions.

3. Power Output

The output of a generator varies, according conditions at the power plant, fuel costs, or the operator at the electric grid. Many renewables are not yet consistent with supplies and are therefore backed up with non-renewables to keep a steady supply.

4.Circuit / system Connections

When designing electrical /electronic products, designers need to consider where and how the circuit or system will be connected to it. Eg. Use of sockets/plugs/ connectors/terminals.



5. Cost

The choice of energy supply by the designer of a product will have an impact on the running costs of it, and so needs to be considered carefully.



EVALUATING NEW AND EMERGING TECHNOLOGIES TO INFORM DECISIONS

CORE 1.3 **2**

1. What is a power system?

(1 mark)

2. Give one benefit of using a prismatic cell battery for a mobile phone, as opposed to cylindrical cell batteries.

(1 mark)

3. Explain why dead batteries must not be put in a household bin.

(1 mark)

4. Name 3 products in your house that uses mains electricity:

1

2

3

(3 marks)

5. Government grants for solar panels are available for households, but only those with south-facing roofs. Why do you think this is not extended for houses with west-facing roofs?

(2 marks)

6. Name 3 considerations for a designer when they are designing a new laptop.

1.

2.

3.

(2 marks)

7. Why do you think there is a spike in electricity usage after a popular TV programme has finished?

(1 mark)

8. Solar panels are made up of **P**_____ - **V**_____ **C**_____

(1 mark)

9. Why are some people opposed to renewables?

(1 mark)

Total Marks: /13