

KNOWLEDGE ORGANISER

BIG IDEA: ENERGY

TOPIC: ENERGY RESOURCES

Key Word	Definition
Energy resource	Something with stored energy that can be released in a useful way.
Non-renewable	An energy resource that cannot be replenished and will be used up.
Renewable	An energy resource that can be replenished and will not run out. Examples are solar, wind, waves, geothermal and biomass.
Fossil fuels	Non-renewable energy resources formed from the remains of ancient plants or animals. Examples are coal, crude oil and natural gas.

Fossil fuels

Crude oil, coal and gas are **fossil fuels**. They were formed over millions of years, from the remains of dead organisms:

- coal was formed from dead trees and other plant material
- crude oil and gas were formed from dead marine organisms

Energy from the burning fuel is used to boil water. The steam turns **turbines**, and these turn electrical **generators**. Unfortunately, the use of fossil fuels releases pollution, including:

- carbon dioxide, which is a **greenhouse gas** and increases **global warming**
- sulfur dioxide and nitrogen oxides, which cause **acid rain**

Geothermal energy

The hot rocks beneath the Earth's surface heat water, and this may rise to the surface naturally as hot water and steam. Here the steam can be used to drive turbines and electricity generators.

Advantages

- Geothermal energy is a renewable energy resource.
- There are no fuel costs and no harmful polluting gases are produced.
- The hot water and steam can be used to heat buildings directly.

Disadvantages

- Most parts of the world do not have suitable areas where geothermal energy can be exploited.

Solar energy

The Sun is a renewable energy resource.

Solar cells

A **solar cell** is a device that converts light energy directly into electrical energy. Some pocket calculators use solar cells, and you may have seen large panels of solar cells on house roofs.

Solar heating

Do not confuse solar cells with **solar panels**, which use energy from the Sun to heat up water. These may also be put onto house roofs so that they can absorb the Sun's energy.

Advantages

- Solar energy is a renewable energy resource.
- There are no fuel costs and no harmful polluting gases are produced.
- Solar cells can provide electricity in remote locations where there is no mains electricity.

Disadvantages

- Solar cells are expensive and inefficient, so the cost of their electricity is high.
- Solar cells do not work at night and not as well when it is cloudy.

Wind energy

The wind is produced as a result of large movements of air, driven by energy from the Sun. This means that the **kinetic energy** in wind is a renewable energy resource.

Wind turbines

They have huge blades mounted on a tall tower. The blades are connected to a generator. As the wind blows, it transfers some of its kinetic energy to the blades, which turn and drive the generator.

Advantages

- Wind is a renewable energy resource. There are no fuel costs and no harmful polluting gases are produced.

Disadvantages

- Wind farms are noisy and may spoil the view for people living near them.
- The amount of electricity generated depends on the strength of the wind. If there is no wind, there is no electricity.

Waves

The water in the sea rises and falls because of waves on the surface. Wave machines use the kinetic energy in this movement to drive electricity generators.

Tides

A tidal barrage is a barrier built over a river estuary to make use of the kinetic energy in the moving water. The barrage contains electricity generators, which are driven by the water rushing through tubes in the barrage.

Hydroelectric power

The water usually comes from behind a dam built across a river valley. The water high up behind the dam has a lot of **gravitational potential energy**. This is transferred to kinetic energy as the water rushes down through tubes inside the dam. The moving water drives electrical generators, which may be built inside the dam.

Advantages

- Water power in its various forms is a renewable energy resource.
- There are no fuel costs and no harmful polluting gases are produced.
- Tidal barrages and hydroelectric power stations are very reliable and can be easily switched on.

Disadvantages

- It has been difficult to scale up the designs for wave machines to produce large amounts of electricity.
- Tidal barrages destroy the habitats of estuary species, including wading birds.
- Dams flood farmland and push people from their homes.
- The rotting vegetation underwater releases methane, which is a **greenhouse gas**.

Nuclear fuels

The main nuclear fuels are uranium and plutonium. In a nuclear power station, the energy released is used to boil water. The expanding steam spins turbines, which then drive generators to produce electricity.

Advantages

- Unlike fossil fuels, nuclear fuels do not produce carbon dioxide or sulfur dioxide.

Disadvantages

- Like the fossil fuels, nuclear fuels are non-renewable energy resources. They will run out one day if we keep on using them.
- If there is an accident, large amounts of **radioactive** material could be released into the environment. In addition, nuclear waste remains dangerously radioactive and harmful to health for thousands of years. It must be stored safely.

I should already know:

- The design process
- Apply correct workshop Health and Safety

I will learn:

Workshop Safety

You will understand how to work safely in the workshop. You will show you can follow key health and safety rules and use tools with a sensible manner.

Practical Skills

You will use a range of tools and equipment to create your bug hotel. You will learn how to mark out with accuracy and use tools and equipment to cut and secure material together and problem solve.

CAD/CAM

You will understand how CAD/CAM plays a wide part in Technology and how it has changed the design and manufacturing industry. You will explore elements of CAD/CAM through the use of the laser cutter.

This will help in the future:

Understand a range of tools and equipment which will help you throughout technology. You will also understand the importance of marking out with accuracy.

Key Words

Hardwood	the hard, compact wood or timber of various trees, as the oak, cherry, maple, or mahogany. It is slow growing and more expensive than softwood
Manufactured board	A wood based material made up from layers of recycled wood usually held together with an adhesive
Softwood	A softwood normally comes from an evergreen tree such as pine. It is cheaper than hardwood and grows faster
Product Analysis	A way to look at and describe/ break down existing products
Design Brief	A statement used to inform the designing of a product
Manufacture	The making of a product



Greater Depth Challenge

Research into the environmental impacts of wood. What will happen if we chop down too many trees? How do we ensure this does not happen?

Further Reading

Non Negotiables in The Workshop - Health & Safety

Your safety is the most important factor in the workshop. We are ALL responsible for our own safety, as well as those around us.

There are some basic rules when in the workshop;

- Carefully listen to instructions
- Do not interfere with others
- Keep a safe distance when others are using machinery
- Know where the emergency stop buttons are
- Always wear an apron
- Always wear eye protection
- Do not have any loose clothing
- Tie long hair back and tuck in ties
- Do not touch any tools/equipment until instructed by the teacher

DO NOT use equipment until you have been fully instructed on the safe use of the equipment. Your teacher will sign to confirm you have received the training



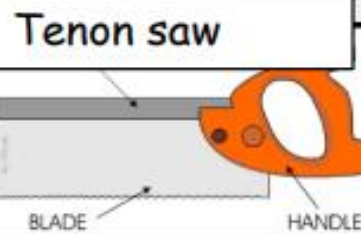
Tools & Equipment



Pillar Drill



Belt Sander



Tenon saw



Power Drill

Try-square



Task: Create a guide to using all or some of the tools and equipment you have used/will be using this half term

WHAT ARE SOFTWOODS ?

Softwoods are from trees that have needles / exposed seeds, not leaves. They grow quickly, compared to most hardwoods. When sawn and planed they tend to be light/pale in colour. Softwoods also tend to be cheaper than hardwoods.

Softwoods are used by the construction industry and are used to produce paper pulp, and card products.



WHAT ARE HARDWOODS ?

Sometimes called broad-leaf trees. Lose their leaves seasonally, in winter. Hardwoods tend to be harder than softwoods (with the exception of Balsa Wood). They have a wider variety of colour and texture than softwoods. Hard woods tend to be more expensive than softwoods and take longer to mature.

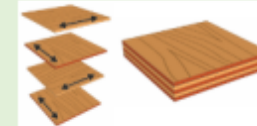


WHAT ARE MANMADE BOARDS ?

Manmade boards are commonly used in the construction industry, for interior fittings and furniture. They are more stable than natural woods and are less likely to warp and twist out of shape.

The three main types are; plywoods (laminated boards), particle boards and fibreboards.

They are all manmade in factories / mills. They are usually composed of natural woods and resin, which binds them together.



Task: Cutting down trees to use for wood has an impact on the environment. Research what FSC stands for and how it helps reduce the environmental impacts

Task: You will use a manufactured board this half term. Research into what a manufactured board is. Why is it different to a hardwood and softwood? Why is it a popular choice of material?

Task: Why are trees play such an important role in our eco-system? Create a research sheet to show your findings

<http://www.davey.com/arborist-advice/pdfs/environmental-benefits/>

