

St Ivo Academy

Design Technology Department

Light Sensor Project

Knowledge Organiser

How is electricity generated?

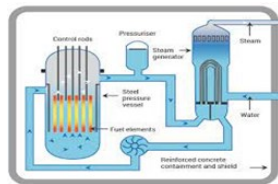
Electricity is a convenient source of energy and can be generated in a number of different ways using either fossil fuels or renewable and sustainable technologies (finite and non-finite).

Finite

Fossil fuels include coal, oil and natural gas. They were formed from the remains of living organisms millions of years ago and they release heat energy when they are burned. They are non-renewable.



The main nuclear fuels are uranium and plutonium. In a nuclear power station, a nuclear reaction releases heat – nuclear energy is converted to heat energy:

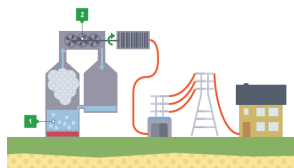


Both methods use:

Power stations fuelled by fossil fuels or nuclear fuels are reliable sources of energy, meaning they can provide power whenever it is needed. However, their start-up times vary according to the type of fuel used.

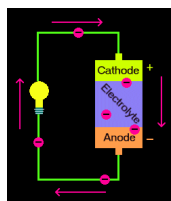
Heat is used to change water into steam in the boiler.

The steam drives the turbine (heat to kinetic energy). This drives the generator to produce electricity – kinetic to electrical energy.



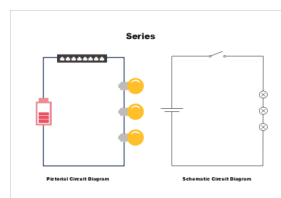
What is circuit?

Circuit comes from the word circle. A circuit is a collection of real components, power sources and signal sources, all connected so current can flow in a complete circle.



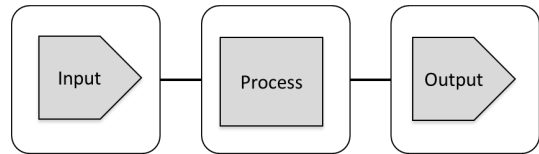
What is a circuit diagram?

It is a simplified conventional graphical representation of an electrical circuit. A pictorial circuit diagram uses simple images of components



What is a system?

A system is a collection of elements or components that are organised for a common purpose. Systems can include biological, mechanical and electrical examples, but all systems are made up of 3 parts:



Input: allow systems to understand changes in the environment around them. For example, a sensor like a light-dependent resistor (LDR)

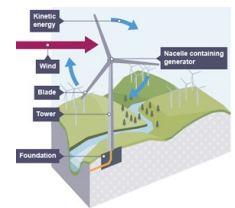
Process: takes the signal from the input stage of a system and acts on it by changing it in some way.

Output: allows a system to present information back into the 'real' world. They take the signal from the process device of a system and turn it back into physical or 'real world' signal, such as light or sound.

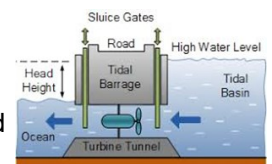
How is electricity generated?

Non-finite

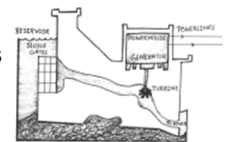
Wind energy is produced as a result of giant convection currents in the Earth's atmosphere, which are driven by heat energy from the Sun. This means that the kinetic energy in wind is a renewable energy resource - as long as the Sun exists, the wind will too.



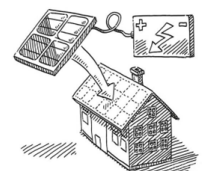
Tidal energy huge amounts of water move in and out of river mouths each day because of the tides. A tidal barrage (a kind of dam) is built across estuaries, forcing water through gaps to make use of the kinetic energy in the moving water. The barrage contains electricity generators, which are driven by the water rushing through tubes in the barrage



Hydroelectric like tidal barrages, hydroelectric power (HEP) stations use the kinetic energy in moving water. Often, the water comes from behind a dam built across a river valley. The water high up behind the dam contains gravitational potential energy. This is transferred to kinetic energy as the water rushes down through tubes inside the dam.



Solar energy is used to generate electricity and to produce hot water. Solar energy is energy released by nuclear fusion in the Sun. Solar cells are devices that convert light energy directly into electrical energy.

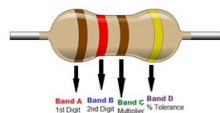


Components used in light sensor

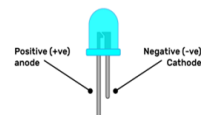
Components: small devices that are used in circuits to perform specific functions. For example, switching a lamp on at night or switching a heater on when it becomes cold.

A potential difference (or voltage) across a component is needed to make a current flow through it. Resistance is the extent to which an electrical component restricts current.

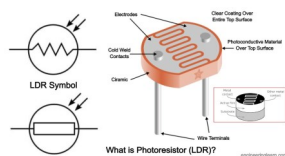
Resistors are electrical components that restrict the flow of electric current.



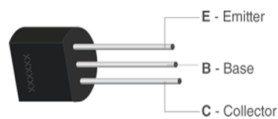
Light-emitting diodes (LEDs) are lamps that produce light when a current flows through them in the forward direction.



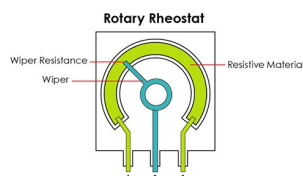
Light-dependent resistors (LDRs) are used to detect light levels, e.g. in automatic security lights. Their resistance decreases as the light intensity increases.



Transistors are tiny electronic switches



Variable resistors are resistors that change resistance from zero to a certain maximum value. They are commonly used as volume controls and voltage regulators.



What is a manufacturing process?

Manufacturing is the process of turning raw materials or parts into finished goods, through the use of tools, human labour and machinery.

What is a production assembly process?

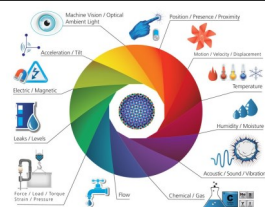
A production process breaks the manufacturing of a product into steps that are completed in a pre-defined sequence.

What is troubleshooting?

A systematic approach to problem-solving that is often used to find and correct issues with complex machines, electronics, computers and software systems.

Sensors

A sensor is a device that detects and responds to some type of input from the physical environment. The specific input could be light or heat.



Soldering Process and Health and Safety

Soldering is the only permanent way to 'fix' components to a circuit. However, soldering requires a lot of practice as it is easy to 'destroy' many hours preparation and design work by poor soldering.

Always keep the soldering iron in the holder when it is not in use. Use a wet sponge to clean the tip of the soldering iron.

Place the PCB with its components in position, in the bull clip. This will steady the PCB when you try to use the soldering iron. They will prevent accidental burns

The heated soldering iron should then be placed in contact with the track and the component, to heat them up. Once they are heated, the solder can be applied. The solder should flow through and around the component and the track.

Having completed the soldering of the circuit, the extended legs on the components need to be trimmed using wire clippers. The circuit is now ready for testing.

Always wear an apron when soldering to prevent accidental burning of clothing.

Always wear safety glasses when soldering to protect your eyes. The soldering iron can 'spit' sometimes.

Do not allow fumes to form.

Use a bench suitable for soldering

Wash you hands after soldering. Soldering must be supervised by your teacher.

Always inspect the soldering iron before soldering. Report damage immediately to your teacher.

Poor soldering joint

Although the finished joint looks quite good, the solder has not penetrated the copper track. It is unlikely that the circuit will work.

The solder has jumped across a gap between tracks, joining the two component pins/legs. The circuit will not work.

Good soldering joint

When soldering, the ideal finish to the soldered joint is a 'concave fillet', as shown in the example to the right.

