

This is an energy store, and this is an energy store, and this is an energy store, and this is Energy.

Energy is defined as, “The ability to do work”, therefore energy is a concept, and energy cannot really be visualised. Energy is needed for all sorts of **processes**, we use energy to power our bodies, cars, lightbulbs, and so much more.

Energy can be stored in several forms. Kinetic energy is the energy of motion.

Thermal energy is the energy possessed by an object or system due to the movement of its particles. The faster these particles move, the higher the thermal energy and, consequently, the higher the temperature of the object.

Chemical energy is a form of potential energy stored in the bonds of chemical compounds, such as molecules and atoms. This energy is released or absorbed during chemical reactions when bonds between atoms are broken and new bonds are formed.

Elastic potential energy is the energy stored in elastic materials as a result of their stretching or compressing. This type of energy is present in objects that can return to their original shape after being deformed, such as springs, rubber bands, and other elastic materials.

Gravitational potential energy is the energy an object possesses because of its position in a gravitational field. If an object is raised off of a surface in a gravitational field, gravitational potential energy will act upon it.

Electrostatic energy is the potential energy stored in a system of charged particles due to their electric charges relative to each other. This energy arises from the electrostatic forces, which are the forces of attraction or repulsion between electrically charged objects.

Magnetic energy is the energy stored within magnetic fields.

Nuclear energy, also known as nuclear potential energy, is the energy stored in the nucleus of an atom. This energy is a result of the strong nuclear forces that hold the protons and neutrons together within the nucleus.

Energy can be transferred between stores. This ability is crucial for many processes. Energy can be transferred mechanically. Mechanical energy transfers occur through direct

contact, motion, and work. Think of mechanical energy transfers as the way energy moves when things interact with other things physically. When you kick a football and it starts moving, you're transferring energy from your muscles to the football, making it move.

Energy can also be transferred electronically. Electrical energy transfer involves the movement of electric charges through a conductor, such as a wire, resulting in the transfer of energy from one place to another.

Energy can also be transferred by heating. Transferring energy through heating involves the movement of heat from a source to a recipient, increasing the recipient's internal energy and often its temperature. Essentially, it is the movement of heat energy from a hotter object or thing, to a colder object or thing.

The conservation of Energy is a law of physics that states that energy cannot be created or destroyed, only transferred.

Useful energy is energy that successfully transfers from the source to the desired recipient.

Waste energy is energy that gets transferred to the environment. For example, heating a kettle causes useful energy to be transferred to the water, but transfers wasted energy to the surroundings in the form of sound energy.

We can reduce the amount of energy wasted by introducing certain measures. We can use lubricant to reduce the amount of energy wasted through friction. We also use insulation to reduce the amount of energy wasted as heat loss.

In our homes, we use a lot of forms of insulation. We have thick walls, to create a greater barrier against conduction of heat transfer between the inside and outside of the home. Thicker walls also have more material, which increases their thermal mass. Thermal mass refers to the ability of a material to absorb and store heat. Thick walls can absorb heat during the day and release it slowly at night, helping to stabilize indoor temperatures.

Our homes may have cavity walls, which are walls that are constructed with empty space between them. The empty space contains air, which is a poor conductor of heat, so therefore reducing the amount of heat transfer between the inside of the home, and the outside world.

The windows of our houses may be double glazed. Double glazed windows consist of two panes of glass separated by a space filled with air. They work in a similar way to cavity walls, the air-filled space between the glass panes acts as insulation, reducing heat transfer through the window.

We also use loft insulation to reduce the amount of heat lost from convection.

We can obtain energy from energy sources.

Solar energy sources such as solar panels are made up of multiple photovoltaic (PV) cells, which are typically made of semiconductor materials such as silicon. When sunlight hits these cells, it excites the electrons within the semiconductor material, causing them to break free from their atoms. PV cells have an electric field that forces these freed electrons to flow in a certain direction, creating a current. This flow of electrons is what we know as electricity. Solar power has the advantages of being renewable, non-polluting, and reliable in sunny countries. However, solar power has the disadvantages of requiring lots of energy during construction, solar farms take up a lot of space, requiring deforestation, and can only function during the day.

Geothermal sources harness heat from the Earth's interior through wells drilled into geothermal reservoirs. This heat can be used to heat water, evaporating it into steam, and then allowing the steam to turn steam turbines, which generate electricity. Geothermal power has the advantages of being renewable, low-polluting, and it's very reliable. However, it has the disadvantages of the fact that geothermal reservoirs can only be found in very few places, and greenhouse gases may be released if they were trapped in the geothermal reservoir.

Wind sources, such as wind turbines work by relying on wind to turn giant propeller blades, which turn a turbine to generate electricity. Wind power has the advantages of being renewable, it is non-polluting, and has cheap running costs. However, wind turbines have the disadvantages of being ugly, and they are unreliable as they will only work if there is wind.

Hydroelectric power uses a dam to hold a large source of water. Within the dam are sluice gates, which when open allow water to flow through the dam due to the gravitational potential energy stored in the water. As the water passes through the dam, it turns turbines, which generate electricity. Hydroelectric power has the advantages of being renewable and causing no pollution. However, hydroelectric power has the disadvantages

of being very expensive to create and run, and the damage that they cause to the environment by destroying animal habitats and disrupting fish migration, fish could also get killed in the turbines.

Wave power involves using buoys, which are attached to the seafloor by a deadweight and connected by a rod. On the rod, a generator is situated. As the waves of the sea move up and down, so does the buoy, which, as it is attached to the generator, slides the generator's magnets up and down with it, generating electricity. Wave power has the advantage of being renewable and non-polluting. However, it has the disadvantages of being unreliable as it requires the presence of waves and disturbing the seabed.

Tidal power works by capturing the kinetic energy of ocean tides using tidal barrages, which trap the incoming tide in a basin. The barrage's sluice gates will open to allow water to flow back out. As it flows out, it is passed through a generator, generating electricity. Tidal power has the advantages of being renewable, a high reliability, and no pollution. However, they have the disadvantages of affecting wildlife habitats, and potentially killing fish in the turbines.

Biofuels generate energy through the burning of plant matter, which is used to heat water, which turns to steam and is used to turn steam turbines, generating electricity. Biofuels have the advantages of being renewable, carbon neutral, and they are reliable. However, they have the disadvantages of being expensive, and require deforestation to clear room to grow enough of the required plants.

The previous examples of energy sources are all renewable energy sources. The fact that they are renewable, means that they will never run out.

The opposite of non-renewable is renewable. Renewable sources will run out faster than they can be replenished.

Examples of non-renewable energy sources are fossil fuels, and nuclear power. We don't need to cover nuclear power until P4, so lets take a look at fossil fuels.

Fossil fuels, such as coal, oil and gas, are burned to heat water, which then turns to steam, so that it can turn a steam turbine and produce electricity. Fossil fuels have the advantages of being reliable, they're relatively cheap to purchase, and output a high amount of energy when burned. However, they have the disadvantages of being non-renewable, and they emit greenhouse gases.

