

unit

5

Energy

What is energy?

1

It is the ability to do work

Energy is how things **change and move**. We need energy to run, walk, eat, and more.



2

It exists in different forms

Such as electrical, chemical, thermal, motion, sound and many more!

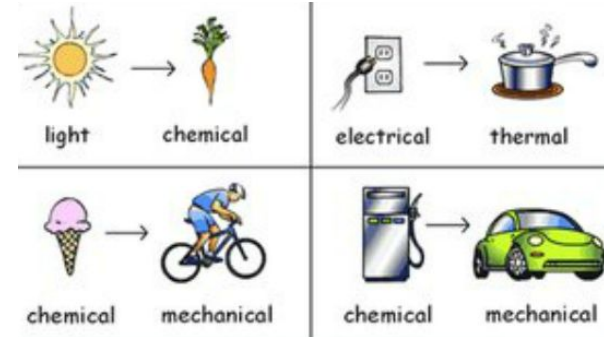


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3

It cannot be created nor destroyed

Energy can only be **transformed** into other forms of energy.



1

States of energy

There are 2 states of energy: **potential** and **kinetic**.

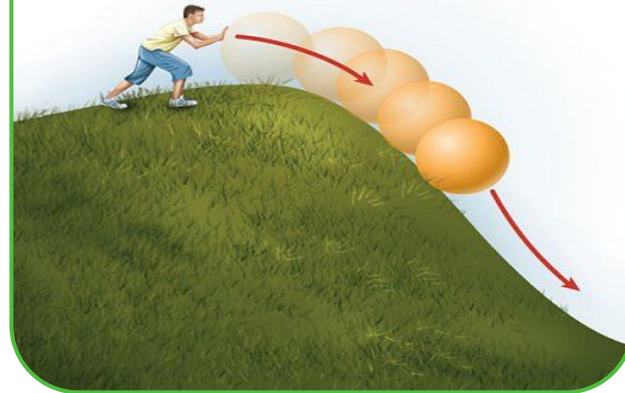
Potential energy

is the energy present in an object because of its **position**



Kinetic energy

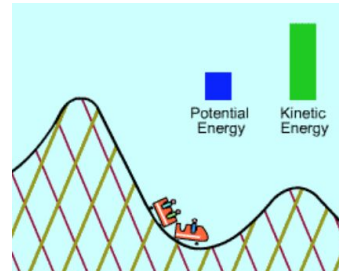
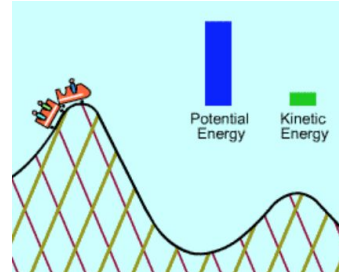
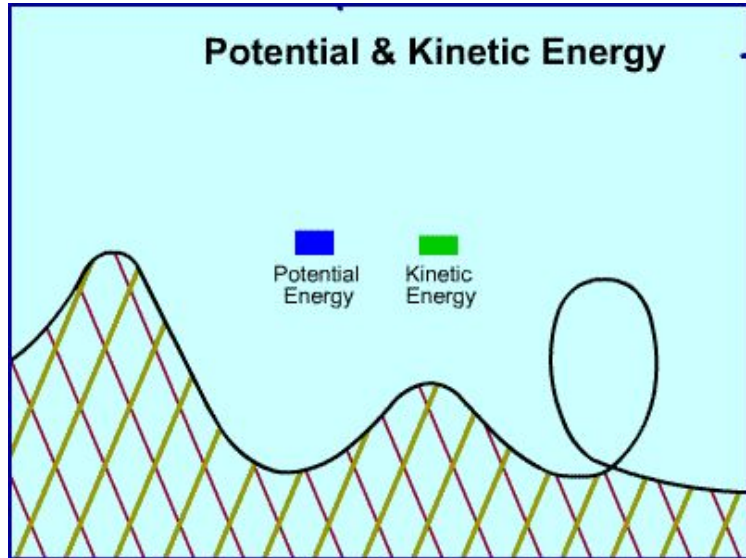
is the energy present in **moving** objects



1. STATES OF ENERGY

The energy of an object because of **both** its **position** and **motion** is called **mechanical energy**.

(**potential** + **kinetic** = **mechanical**)



P.E. is highest when the cart is **positioned** at the highest peak of the rails.

K.E. is highest when all the P.E. is released through the cart's **movement** downward.

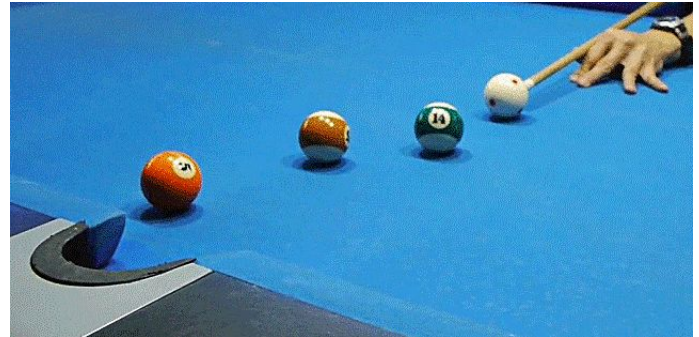
2

Properties of energy

There are 4 main properties of energy.

① Energy can be transferred from one object to another

In billiards, energy is transferred from:
the arm → stick → white ball → green ball



2. PROPERTIES OF ENERGY

② Energy can be stored

Batteries store electrical energy in the form of chemical energy, and convert that into electricity.

③ Energy can be transported

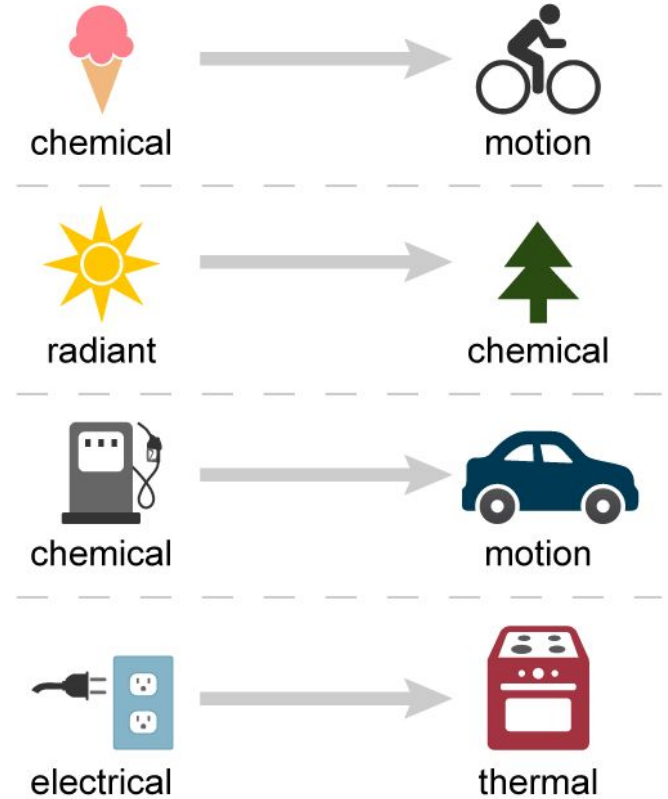
Electrical energy can be transported through cables.



2. PROPERTIES OF ENERGY

4 Energy can be transformed from one type of energy to another

For example, petrol in a car stores chemical energy. When the car moves, it transforms into motion or kinetic energy.



3

Chemical energy

Chemical energy is **stored** energy, and can be **transformed** into different forms of energy.



electrical energy



kinetic energy



thermal energy

4

Non-renewable energy

These sources are found in **deposits** underground. They took millions of years to form.

Because we consume them faster than we can replenish them, they will **run out** one day.

Fossil Fuels

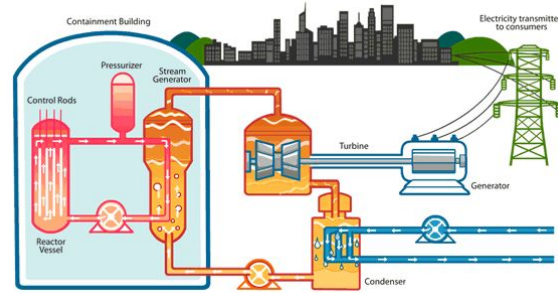
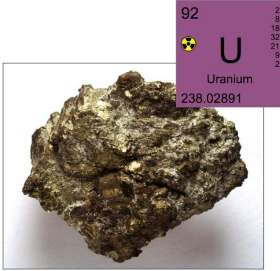


Uranium



Uranium

It is a radioactive substance found naturally in rocks. It is used in nuclear power stations, but it will run out one day.



Uranium is used to produce nuclear energy.



Nuclear energy heats water to produce steam.



The **steam** is used to produce electricity.

Nuclear energy

Advantages



1. Production of nuclear energy does not **pollute** the air.



2. It is **cheap** to produce.



3. It does not create a lot of **waste**.



4. Very small amounts of uranium produce large amounts of **energy**.

Disadvantages



1. Nuclear power plants are very expensive to **build**.



2. Nuclear waste is highly **contaminating**.



3. Accidents can cause **harmful** consequences.



4. Nuclear waste needs hundreds of years to stop being **radioactive**.

4. NON-RENEWABLE ENERGY: Fossil fuels

Fossil fuels

Around 70% of the energy we use today comes from fossil fuels.



Coal is a sedimentary rock formed from plant matter



Petroleum is a thick liquid found in rocks near the Earth's surface



Natural gas is found deep beneath the ground

Global warming

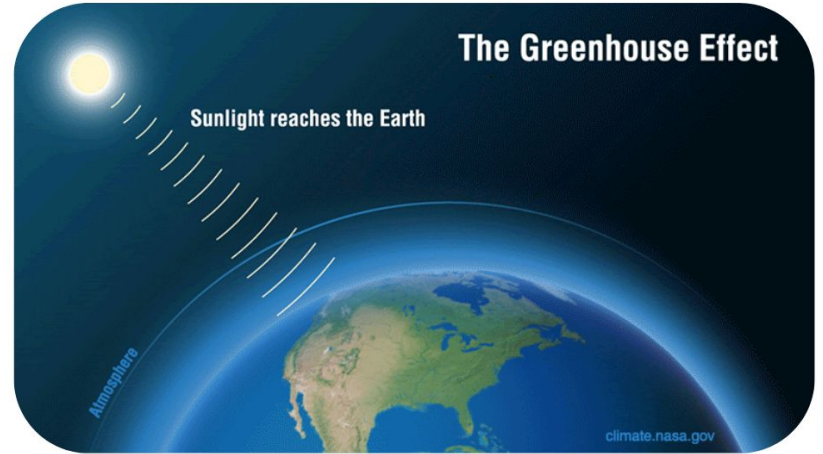
This is the heating up of the Earth due to the **burning of fossil fuels**, which releases **greenhouse gases** such as **carbon dioxide** (CO₂).



4. **NON-RENEWABLE ENERGY:** Fossil fuels → *Global warming*

1 Sunlight reaches the Earth

Thermal energy from the sun is absorbed by the Earth's surface. This heats up the Earth.



2 Some sunlight returns to space



4. **NON-RENEWABLE ENERGY:** Fossil fuels → *Global warming*

③ **Some heat is naturally retained by the atmosphere**



④ **Greenhouse gas emissions**

Burning of fossil fuels releases high levels of carbon dioxide into the air.



4. **NON-RENEWABLE ENERGY:** Fossil fuels → *Global warming*

5 Greenhouse gases form a layer around the Earth

The carbon dioxide and other gases raise the heat trapped in the atmosphere.

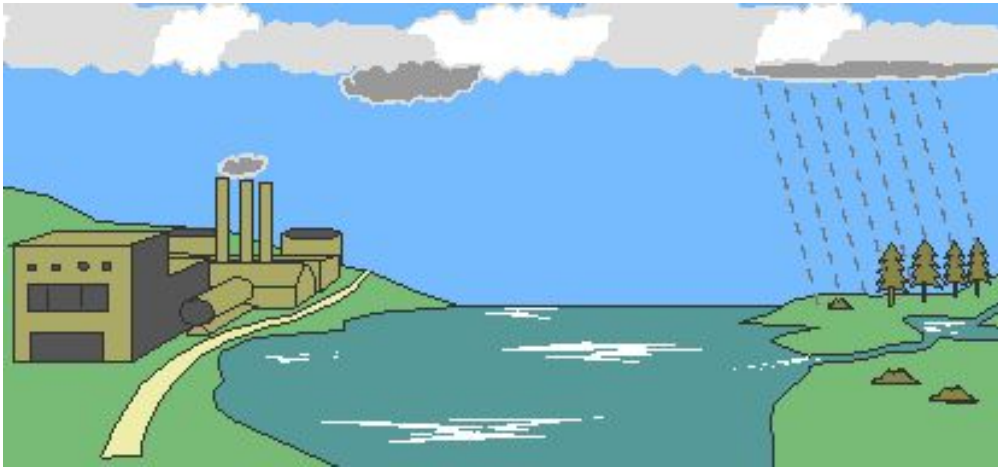
6 Our planet gets hotter

This increase in temperature is called global warming.



Acid rain

The burning of **fossil fuels** also releases gases such as **sulphur dioxide** (SO_2) and **nitrogen dioxide** (NO_2) by factories and cars.



The wind carries these gases up into the sky.

The gases mix with water droplets in clouds and produce **acids** that fall as precipitation.

4. **NON-RENEWABLE ENERGY:** Fossil fuels → *Acid rain*



Acid rain damages **ecosystems** and pollutes oceans and land.



It kills the **animals** and **plants** living there.



It also deteriorates **buildings**.

5

Renewable energy

These come from **natural resources** that will never run out.

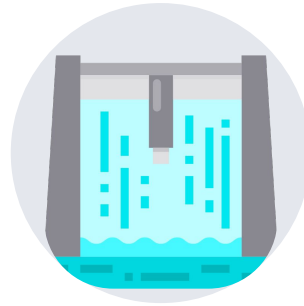
Renewable energy sources include:



Sunlight



Wind



Flowing water

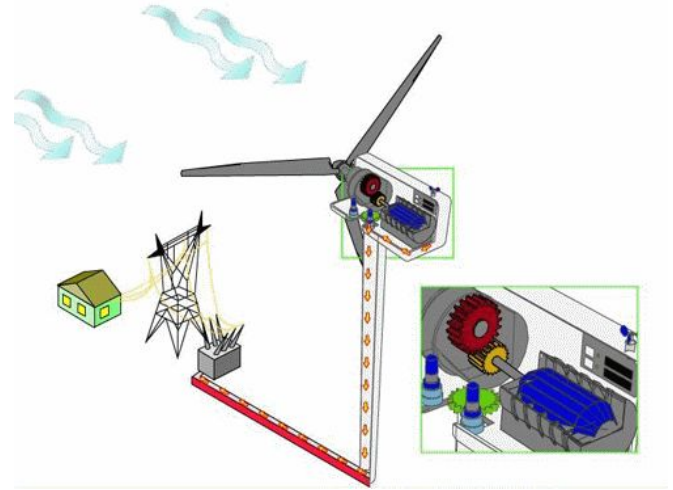


Biomass

1 Wind turbines

Wind moves the blades. The kinetic energy from this movement is transformed into electricity.

They can also be dangerous for birds. Wind farms change the landscape.



2 Hydroelectric energy

In hydroelectric power stations, water turns a generator, which transforms the kinetic energy from flowing water into electricity.

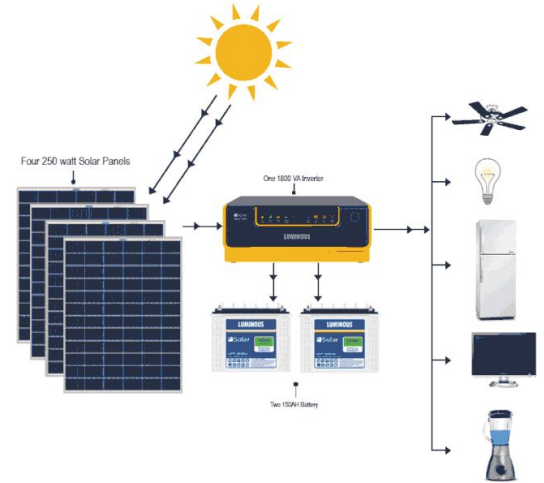
Hydroelectric energy does not pollute, but dams destroy animal and plant habitats.



3 Solar panels

These trap solar energy from the sun and transform them into electricity.

Solar energy can only be captured during the day.



4 Tidal energy

This comes from the movement of tides in the oceans. The kinetic energy from moving water is transformed into electricity.

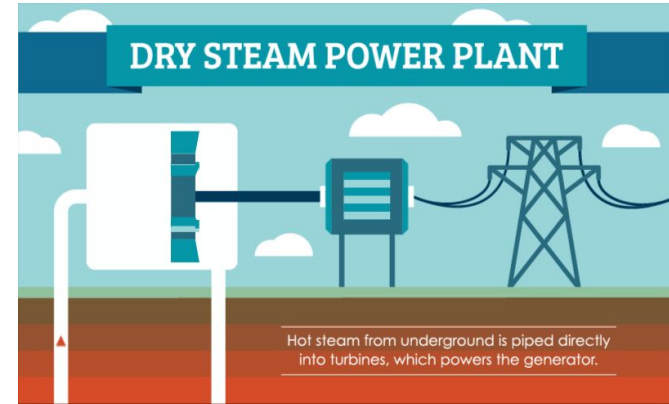
Not all seas have tides.

TIDAL TECHNOLOGIES

5 Geothermal energy

This uses **thermal energy** from inside the Earth to produce electricity. Most geothermal production occurs near volcanic activity.

Building a geothermal power plant is expensive.



6 Biomass

This is an organic matter from plants and animals, such as wood, hay and cattle manure. It has **chemical energy** which can be transformed into electrical or thermal energy.

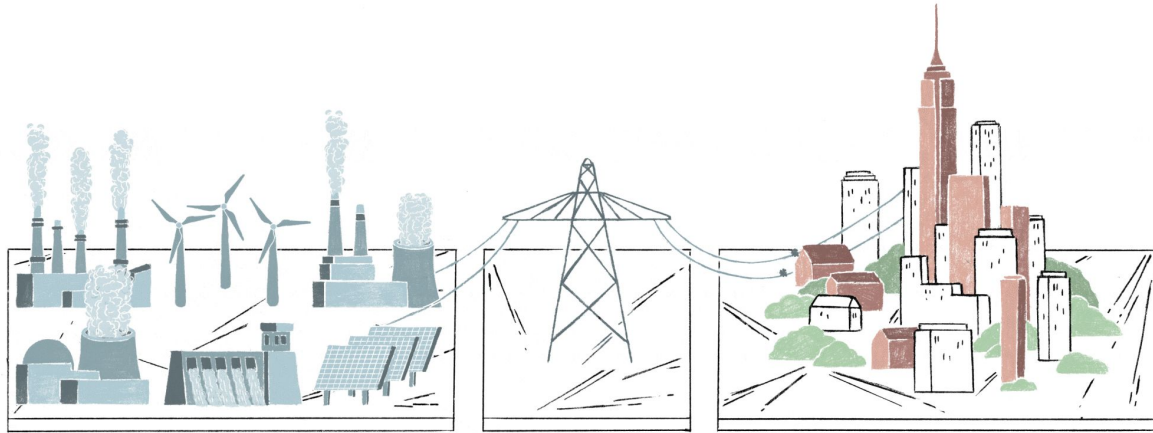
Producing fuels from biomass is expensive.



6

Transporting electricity

Electricity can be made using different energy sources, such as sunlight, wind, water or nuclear fuels and fossil fuels.



Power stations

Power lines

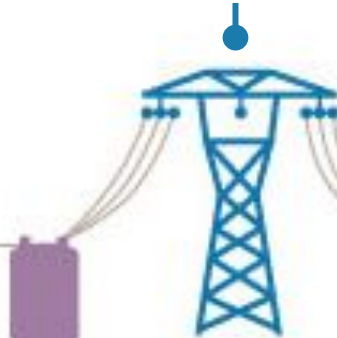
Towns & cities

6. TRANSPORTING ELECTRICITY

Electricity is generated in **power stations** using huge generators.



Power lines carry the electric power to far places.



The power of electricity is increased in a **transformer**, making it dangerous!



A **local transformer** decreases the power and makes the electricity safe to use.



The electricity travels along **distribution cables**.



The electricity is now in our **homes**.