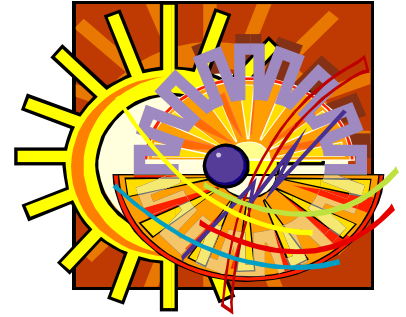


WORDS

- **accident** = catastrophe, disaster
- **although** = while
- **breathe** = to take air into your lungs and send it out again
- **cause** = lead to
- **consume** = use
- **contribute** = add to; also lead to
- **decade** = a time of ten years
- **decay** = to be slowly destroyed by nature
- **dust** = dry powder, mostly made up of small particles of dirt
- **emit** = to send out
- **engine** = a machine that produces power so that it can move
- **eventually** = slowly, as time goes on
- **fossil fuels** = forms of energy like coal or oil that have been produced by dead plants or animals over millions of years
- **generate** = to produce something
- **global warming** = the increase in the atmosphere's temperature that is caused by carbon dioxide
- **goods** = things that are produced so that they can be sold
- **however** = but
- **in turn** = as a result
- **lung disease** = illnesses that make it hard for you to breathe
- **mine** = a place where raw materials are dug out of the earth
- **natural gas** = gas that comes from the earth and is used for energy
- **pollute** = to make dirty
- **provide** = give
- **replace** = to use instead of something
- **scientist** = a person who is trained in science
- **source** = place where something comes from
- **steam** = the hot gas that water produces when it gets hot
- **sulphur oxide** = a light yellow chemical that burns and has a very bad smell; it is combined with oxygen
- **supplies** = gives
- **supply** = reserve

Energy is another word for power. It makes things move and machines work. It **provides** us with light and we use it to heat and cool our houses and offices, to cook our food, and to transport people and **goods**.



SOURCES OF ENERGY

Almost all energy on earth today comes directly or indirectly from the sun. Over millions of years the sun has given plants light and heat which they need in order to grow. When trees and plants **decay** they turn into the **fossil fuels** we use today: coal, petroleum, **natural gas** and others.

About 85 % of all the energy we consume today comes from **fossil fuels**. **However**, we don't have enough to last forever. People burn more and more **fossil fuels** and **eventually** the **supply** will run out. They also **pollute** our atmosphere and **contribute** to **global warming**. So, over the past **decades**, **scientists** have been looking for other **sources** of energy to **replace** these **fossil fuels**.

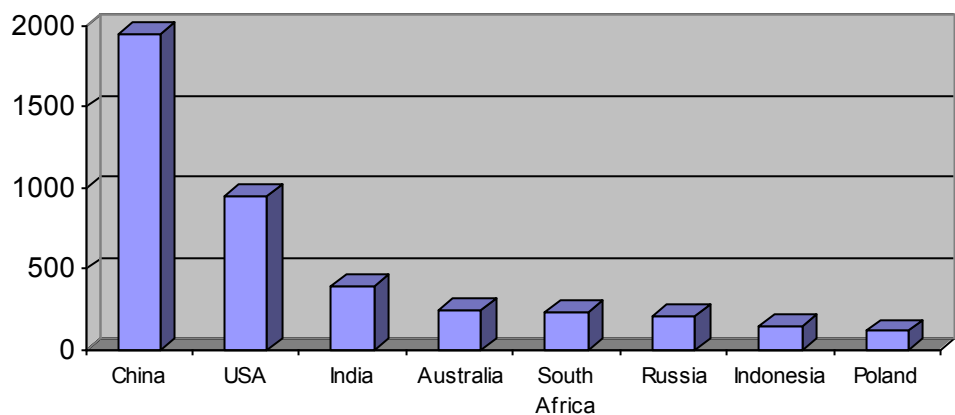
Some of these new **sources** of energy have been used for many years, like wind and water power or heat that comes from the earth.

FOSSIL FUELS

COAL

Coal **supplies** us with about 28% of all the energy used. It is burned to make water hot and produce **steam**. The **steam, in turn, generates** electric power or operates **steam engines**. In many countries people use coal to heat their homes.

Coal **mining** has **caused** many problems in the past. **Accidents** in coal **mines** kill workers every year and **breathing** coal **dust** can lead to **lung diseases**. **Although** many factories have installed cleaning filters, coal **emits sulphur oxides** that **pollute** our air when burned.



Coal production in millions of tons per year

WORDS

- **accident** = catastrophe, disaster
- **cause** = lead to
- **constantly** = all the time, very often
- **crude oil** = oil that comes out of an oil well naturally
- **deposit** = a layer of a mineral or metal in rocks
- **drill** = to make a hole into the earth with a machine
- **drugs** = kinds of medicine
- **environment** = the air, water, land around us
- **extract** = to get something out of a material
- **fertilizer** = something that is put on a field to make plants grow
- **large scale** = here: to be able to produce a lot
- **layer** = material between two things
- **leads to** = cause; the reason for
- **leak out** = to get through a hole and flow into the sea
- **liquid** = fluid, watery
- **major** = important
- **oil shale** = sandy, soft rock that has oil in it
- **petrol** = the liquid that is used to make cars run—in America it is called gas
- **pollution** = when air, water and other resources get dirty, so that you cannot use them any more
- **probably** = likely
- **reach** = get to
- **refinery** = a factory where oil is made purer and into other products
- **remain** = stay
- **reserves** = raw materials
- **run out** = to become less and less
- **smog** = smoke and fog that mix together to produce dirty air
- **source** = place where something comes from
- **supplies** = gives
- **surface** = the top layer of something

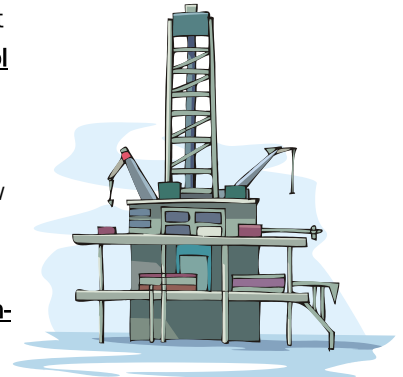
Today, scientists are looking into ways to burn coal in a cleaner way – like turning it into **liquid** or gas first. Such methods are still very expensive and **probably** cannot be used on a **large scale** for years to come.

Coal will **remain** a **major source** of energy for a long time, because the world still has **reserves** to last a few hundred years.

PETROLEUM

Petroleum or **crude oil supplies** the world with about 40% of its energy. It is not only used to make **petrol** and heating oil but chemicals, **fertilizers**, plastics, **drugs** and other products as well.

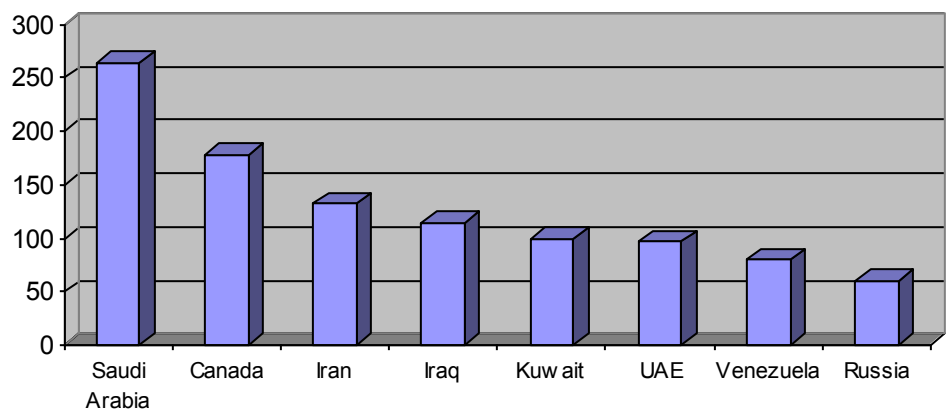
Most of our petroleum lies in rock **layers** deep below the **surface** of the earth. Oil workers pump it out by **drilling** into these **layers**. Then it is transported over long distances, mostly by pipeline or tankers to **refineries**, where it is made into petrol and diesel as well as other petroleum products.



But like coal, petroleum creates problems in our **environment**. Tanker **accidents cause** oil to **leak out** into the ocean. Burning **petrol** or diesel in cars and trucks **leads to smog** and other kinds of **pollution**.

Although oil **reserves** are slowly **running out**, oil companies are **constantly** searching for new **reserves**. Such new **reserves**, however, lie mostly in areas which are very difficult to **reach**.

In some places, like the western United States, there are big **deposits** of oil rock, called **oil shale**. Petroleum can be **extracted** from this rock but such a process is still very expensive.



World oil reserves in billions of barrels

1 barrel = 159 litres

WORDS

- **amount** = how much of something
- **area** = place
- **cause** = lead to
- **cooling tower** = a large round, tall building that industries or power plants use to cool down water
- **decade** = a period of ten years
- **deposit** = a layer of a mineral or metal in rocks
- **disadvantages** = bad sides
- **disease** = illness
- **distance** = space
- **electricity** = the power that is carried in wires and cables ; it gives us light , heat and makes machines work
- **flow** = here: when water moves down a river
- **generator** = a machine that produces electricity
- **harm** = damage
- **layer** = material between two things
- **liquid** = fluid, watery
- **major** = important
- **nuclear** = atomic
- **nuclear fission** = when you split atoms to produce a lot of energy
- **pollutant** = something that makes air or water very dirty
- **pollution** = when air, water and other resources get dirty, so that you cannot use them any more
- **power plant** = a building where electricity is produced
- **process** = method
- **release** = to set free
- **renewable** = something you can use over and over again
- **source** = place where something comes from
- **split** = to separate into two or more parts
- **store** = to put away for a longer time
- **suffer** = to be ill with; to feel pain
- **supply** = give
- **turbine** = a motor in which gas or water moves a wheel around
- **turn out** = if something happens in a certain way
- **waste** = materials that you don't need any more or are left over

NATURAL GAS

About 20% of the energy used worldwide comes from natural gas. **Deposits** are usually found in the same **areas** as petroleum, but there are places, like Siberia that have gigantic gas fields.

Natural gas is a cleaner form of energy because it doesn't have most of the **pollutants** that coal and oil have. The gas is turned into **liquid** and can be transported over long **distances** through pipelines.

OTHER FORMS OF ENERGY

WATER POWER

Water power **supplies** us with about 6 % of global energy. When water falls from higher to lower places it creates the power to turn big **turbines**. **Generators** turn this power into **electricity**.

Water power plays a **major** role in areas where there are mountains and many rivers, like Austria, Switzerland and Scandinavia. These countries produce most of their energy this way.

It does not **cause pollution** and because water in mountain areas and rivers always flows we call it a **renewable source** of energy.

NUCLEAR ENERGY

About 6 % of total world energy comes from over 400 **nuclear power plants**. When uranium atoms are **split** energy is set free and a large **amount** of heat is created, which is used to produce **electricity**. The **process** of **splitting** atoms is called **nuclear fission**.

When the first nuclear power stations were built in the late 1950s people thought that they would **provide** the world with enough cheap energy, but it **turned out** that **fission** had several **disadvantages**. Because power plants produce a lot of hot water they must have big, expensive **cooling towers**. **Power plants** also produce **waste** that stays radioactive for many years. It must be **stored** in safe places, for example deep inside rock **layers** where it cannot do any **harm**.

The **nuclear** accident at Chernobyl in 1986 showed us that radioactivity , when **released** into the air, **causes** damage to large areas and kills many people. Even **decades** after the accident thousands of citizens who lived around Chernobyl are still **suffering** from **diseases** caused by radioactivity.

Nuclear Power Plants 2005			
USA	103	United Kingdom	23
France	59	South Korea	20
Japan	55	India	16
Russia	31	Ukraine	15

WORDS

- **bay** = part of the sea that is separated by a curve in the coastline
- **big scale** = here: a lot of
- **boiling point** = the temperature at which water boils
- **capture** = here: to get control of something
- **cause** = lead to
- **common** = widespread, normal
- **convert** = to turn into
- **device** = machine that does a special job
- **economical** = cheap
- **electricity** = the power that is carried in wires and cables ; it gives us light , heat and makes machines work
- **engineer** = technician ; someone who does technical things
- **eruption** = outbreak of a volcano
- **fossil fuels** = forms of energy like coal or oil that have been produced by dead plants or animals over millions of years
- **generator** = a machine that produces electricity
- **geothermal** = heat that comes from inside the earth
- **geyser** = a hole in the ground from which hot water and steam come out
- **grain** = the seeds of plants like corn, wheat or rice that are used as food
- **grind** = to break up into small pieces or powder with a machine
- **high tide** = the time when the sea reaches its highest point
- **layer** = material between two objects
- **low tide** = the time when the sea reaches its lowest point
- **movement** = when something moves
- **pocket calculator** = a small machine that you use to do calculations
- **pollution** = when air, water and other resources get dirty, so that you cannot use them any more
- **plate** = a flat metal object
- **provide** = give
- **renewable** = something you can use over and over again
- **seal off** = to stop something from coming in
- **source** = where something comes from
- **steam** = the hot gas that water produces when it gets hot
- **store** = to put away for a longer time
- **supplies** = reserves
- **surface** = top layer of something
- **tidal** = everything that comes from the rising and falling of ocean waves
- **turbine** = a motor in which gas or water moves a wheel around
- **use up** = to use all of something

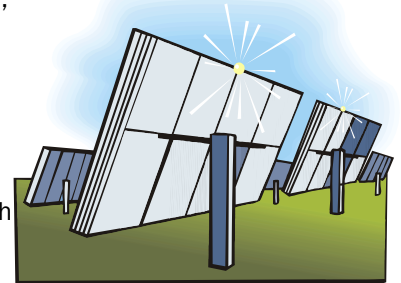
ALTERNATIVE ENERGY SOURCES

As the most **common** and popular forms of energy are being **used up** quickly, the search to find new **sources** of energy is underway. These **sources** of energy must be **renewable** and not **cause** the **pollution** that **fossil fuels** do .

SOLAR ENERGY

The sun can **provide** us with all the energy we need, for free ! The main problem is to collect and **store** this energy in an **economical** way.

Today, we can **capture** energy from the sun with **plates** or cells. Collectors put on roofs of houses and other buildings turn solar energy into heat. With this energy we can heat up water or the air inside.



Solar cells **convert** the sun's light directly into **electricity**. They are used in small objects like watches and **pocket calculators**.

In deserts and other subtropical areas sunlight is **captured** by big mirrors that turn it into heat. Water, which is 30 times hotter than **boiling point**, then creates **steam** which, in turn, produces **electricity**.

GEOHERMAL ENERGY

Geothermal power can be produced in places where water comes into contact with hot rock below the earth's **surface**. The water that reaches these hot areas turns into **steam**, which then produces **electricity**. In places where no natural underground water **supplies** exist, **engineers** pump it into the hot rock **layers**.

Geothermal heat is an important **source** of energy in countries that lie in volcanic areas, like Iceland, Italy, New Zealand, California or the Philippines. **Geysers** are **eruptions** of hot water that come to the **surface**. Such naturally heated water is used to heat homes and greenhouses.

WIND ENERGY

Windmills have been used for centuries to **grind grain** and pump water out of areas that have been flooded, like the Netherlands or the northern parts of Germany.

Today, large wind **generators** turn the power of wind into **electricity**. Such **devices**, however, can only be used in places with strong and constant winds. At the moment, though, costs are too high to produce wind energy on a **big scale**.

TIDAL ENERGY

Tidal energy comes from the **movement** of ocean waves. One way to use the power of waves is to **seal off** a **bay** with a dam. When water moves into and out of the bay it turns a **turbine**, which produces **electricity**.

There are some coastal areas around the world where the difference between **high** and **low tide** is up to 10 metres and more. Great Britain, the Netherlands, Germany or France have coastal regions where such power can be created.

WORDS

- **amount** = how much of something
- **apply** = affect
- **car pool** = a group of people who travel together to work or school in one car
- **conserve** = here: save
- **consumption** = the amount that is used
- **contain** = has
- **crop** = a plant like wheat or rice that is grown by farmers and used as food
- **decade** = a period of ten years
- **develop** = here: make , design
- **energy efficient** = to use as little energy and get as much power as possible
- **ethanol** = here: alcohol that comes from plants
- **fan** = a machine that is used to make air cooler by moving it around
- **fluorescent lamp** = a tube filled with gas which shines brightly when electricity passes through
- **full load** = to make a machine full
- **fusion** = atoms join together to produce power
- **geothermal** = heat that comes from inside the earth
- **hydrogen** = a gas that forms water when mixed with oxygen
- **in contrast** = compared to; as a difference
- **leaky** = something that has a hole in it so that water or other things can get through
- **panel** = a flat piece of a certain material
- **public transport** = buses , trains, subways that are here for everyone to use
- **reduce** = to make something smaller or less
- **renewable** = something you can use over and over again
- **scientist** = a person who is trained in science
- **source** = where something comes from
- **split** = to separate into two or more parts
- **stove** = something you have in the kitchen to cook and prepare meals with
- **sugar cane** = sugar that grows in tropical regions
- **unite** = come together
- **waste** = materials that you don't need any more or are left over
- **well-insulated** = to cover something with a material so that heat does not get out

NUCLEAR FUSION

Fusion may solve all our energy problems. **Hydrogen** atoms are **united** and can produce large **amounts** of energy. **In contrast** to the **splitting** of atoms **fusion** is safer and does not produce a lot of nuclear **waste**.

We have an almost endless amount of **hydrogen** in our oceans but, up to now, **scientists** have not yet come up with a way to produce large **amounts** of such energy. Such a system, which produces cheap energy from our oceans, will probably take years or **decades** to **develop**.

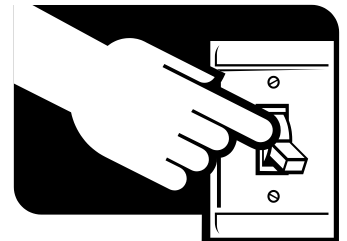
BIOMASS

Biomass is material that comes from plants and animals. It **contains** energy that the sun has produced and when burned produces heat. Wood , plants and **crops** are the most important **sources** of biomass today.

Biomass can also be changed into other forms of energy , like gas, **ethanol** or bio diesel. In Brazil, for example, about 20 % of all cars are driven by **ethanol**, produced from **sugar cane**. Biomass is also a **renewable source** of energy because crops and trees can always grow.

CONSERVING ENERGY

- Turn lights off if you don't need them.
- When possible, use energy saving light bulbs (or **fluorescent lamps**)
- Don't overheat you house. Set the thermostat to about 21 ° C and use a **fan** instead of air conditioning to cool down rooms during the summer.
- Make sure that windows and doors are closed.
- Newly built buildings and houses should be **well-insulated**. Think of using solar **panels**, **geothermal** energy or biomass for heating.
- Save water ! **Leaky** toilets can waste more than 40,000 litres of water in a home every year.
- Save hot water by taking a shower instead of a bath
- Make sure you have a **full load** of dirty dishes before you use the dishwasher. The same **applies** to washing machines and clothes driers.
- If you need to make small amounts of food warm use the microwave instead of the **stove**.
- Make sure refrigerators are always closed, so that the cold air does not **leak** outside.
- When you go shopping take bags with you. It saves money and you don't always need new ones.
- Travelling by bus, train or other means of **public transport reduces** energy **consumption** and pollution.
- Organize **car pools** that take you to work or school.
- Buy smaller, **energy – efficient** cars instead of big ones.
- Recycle as much material as possible



WORDS

- **advantage** = the good sides of something
- **amount** = how much of something
- **average** = usual, normal
- **bauxite** = a soft raw material from which we make aluminium
- **cardboard** = thick brown paper that is used for making boxes
- **consume** = use
- **consumption** = use
- **container** = a box or another object that you use to keep something in
- **developed countries** = rich countries of Europe, North America etc..
- **developing countries** = the poor countries of the Third World
- **disposal** = to get rid of something you don't want
- **dump** = get rid of waste by bringing it somewhere and putting it under the ground
- **landfill** = a place where waste is buried under the ground or on the ground
- **natural resources** = things that exist in nature and can be used by people, like oil, trees, water etc..
- **pollute** = to make dirty
- **reduce** = to make something smaller or less
- **separate** = individual
- **sort out** = to separate one thing from another
- **waste** = materials that you don't need any more or are left over

ENERGY CONSUMPTION

Developed countries use up about 80 % of the world's energy. Today, the United States has about 5% of the world's population but **consumes** one fourth of the world's energy.

A person in a **developing country** uses only about a fifteenth as much energy as someone in the industrialized world.

Country	% of Energy Consumed	% of Energy Produced
United States	25	5
China	9	21
Russia	7	3
Japan	6	2
Germany	4	1
India	3	17
France	3	1
United Kingdom	3	1

RECYCLING

Recycling means using something over and over again. Typical items that can be recycled are newspapers, **cardboard**, aluminium, batteries, glass bottles.

On **average**, every person in the US produces about 1.8 kg of **waste** every day. **Dumping** this waste in **landfills** is expensive and **pollutes** land, air and water. Recycling is one way of **reducing** the **amount** of **waste** we throw away every day.

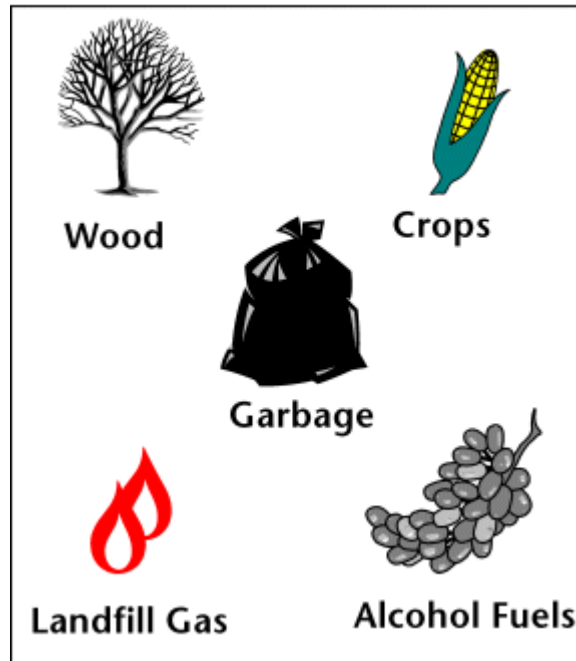
ADVANTAGES OF RECYCLING:

- Recycling **reduces** the amount of waste that is **dumped** in **landfills**.
- It almost always takes less energy to make a product from recycled material than it does to make it from new material.
- By using materials more than once we can save **natural resources**. Recycling paper saves trees and water.
- Recycling creates more jobs.
- Recycling aluminium cans saves 95 % of the energy we need to produce aluminium from **bauxite**.

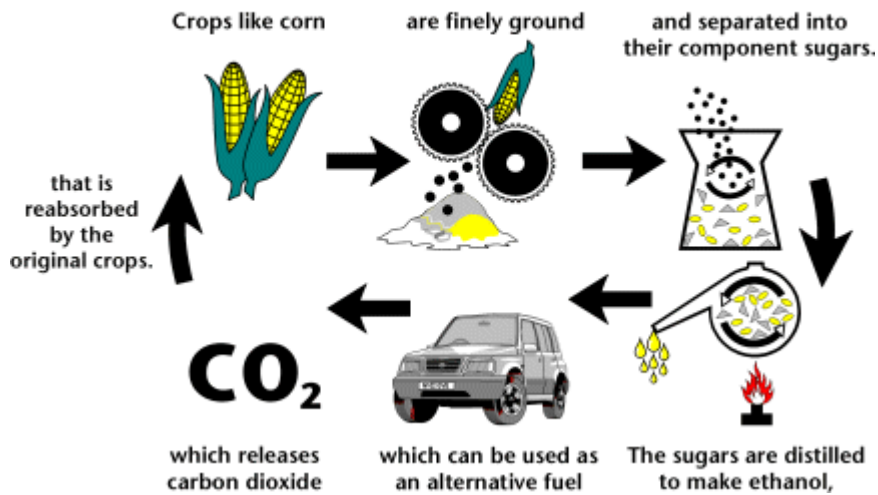
PROCESS OF RECYCLING

- Collect recyclable materials at home and put them into **separate** boxes or waste **containers**.
- Waste **disposal** trucks take them away to recycling factories. There they are cleaned and **sorted out**.
- Industries buy recycled material to make new products.

Types of Biomass



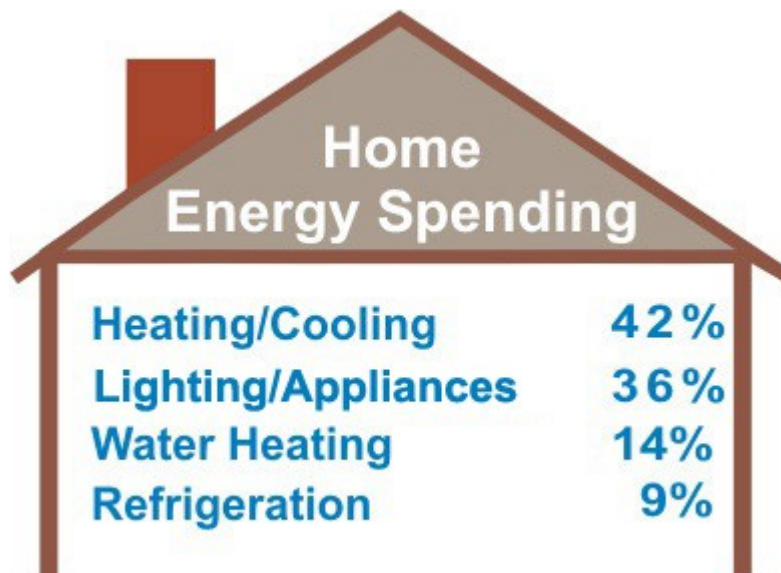
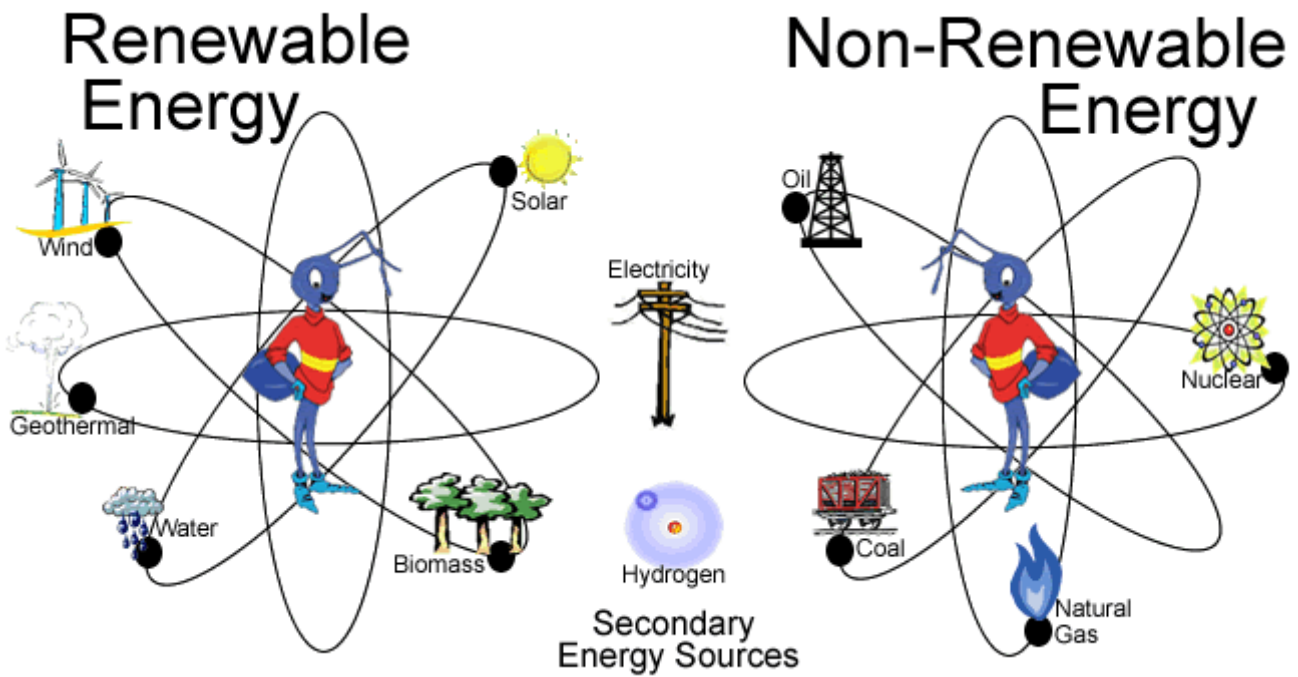
THE CARBON CYCLE



WORDS

- **cycle** = events that happen over and over again
- **distill** = to make something hot so that you can get a special material out of it
- **finely** = thin
- **garbage** = waste

- **ground** = cut into very small pieces
- **landfill gas** = gases that come from places where you dump waste
- **reabsorb** = to take in again
- **release** = let free
- **separate** = divide, keep apart



WORDS

- **appliance** = electrical objects that you have in your house, like TV, radio, computer, etc..
- **refrigeration** = the cooling down of food, for example in a refrigerator