

# Nuclear Energy

**chain reaction** = an event that leads to another event, over and over again

**control rods** = long thin poles or bars of metal that control the chain reaction

**create** = to make

**electricity** = power that is carried by wires or cables. It gives us light and heat and makes machines run

**fission** = the splitting of an atom

**generate** = make

**heat** = something hot

**nuclear power plants** = places where nuclear power is made

**nuclear reactor** = the inner part of a power plant. this is where energy is produced

**nucleus** = the central part of an atom

**petrol** = it is made from oil and is used to make our cars move

**radioactive** = a form of energy that is dangerous for living things

**release** = to set free

**revolve** = to go around

**split** = divide

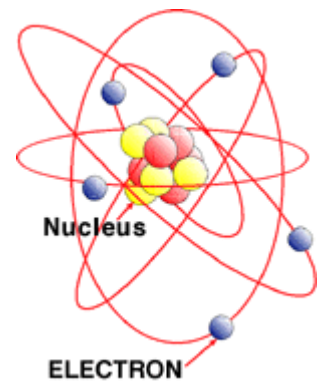
**steam** = the smoke that comes out of water when you make it very hot

**uranium** = a radioactive metal that is found in rock. It is radioactive.

Nuclear power gives us about 17 % of the world's **electricity**. Some countries produce more nuclear power than others. France, for example, gets about 75 % of its energy from **nuclear power plants**, the USA only 15 %. Many countries, like Austria, don't have any nuclear energy at all.

## THE ENERGY OF ATOMS

Nuclear energy comes from the energy inside each atom. Atoms are made up of a **nucleus** with protons and neutrons—and electrons which **revolve** around the nucleus like the earth goes around the sun.



## NUCLEAR FISSION

An atom's nucleus can be **split** apart. when this is done, a lot of energy is **released**. Albert Einstein, the world's most famous scientist, said that you can get a lot of energy out of a small number of atoms. When it is let out slowly, you can use this energy to produce **electricity**, but if you let it out all at once, it can cause a great explosion—like in an atomic bomb.

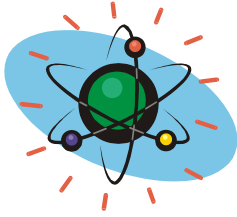
In a nuclear power station **uranium** atoms are split apart to **create** energy. Uranium can be found in rocks on earth, but only a special form of uranium—U 235—can be used to make energy. A pound of uranium has the same energy as about 250 000 litres of **petrol**.

## CHAIN REACTION

In a **nuclear reactor** free neutrons hit a uranium atom and split it. New neutrons are set free and when they run into other uranium atoms they split them again. When this continues over and over again, you call it a **chain reaction**.

**Control rods** are put into the reactor so that the chain reaction doesn't go on so fast. The chain reaction also gives off **heat** energy. This heat is used to make water hot and produce **steam**. The steam turns a turbine to **generate** electricity.

When parts of atoms hit each other they also become **radioactive**, which is very dangerous if it doesn't stay in the reactor.



# Nuclear Energy

**absorb** = to take up

**advantages** = good sides about something

**concrete** = material used for building houses, bridges, roads etc.. You get it by mixing sand, water, small stones and cement together

**core** = the inner part of something

**containment** = the building around a nuclear power station

**dust** = dry powder made up of small bits of dirt

**enrich** = to make something better

**environment** = the world around us

**lower** = to push down

**otherwise** = or else

**radiation** = form of energy that comes from nuclear energy; too much is dangerous

**raise** = to pull up

**rods** = long sticks

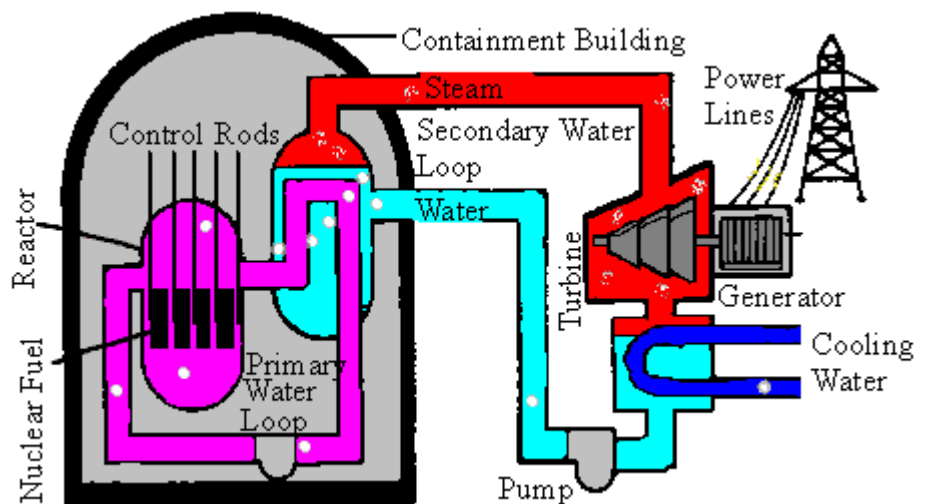
**store** = keep for a time

**used uranium** = the uranium that is spent and cannot be used to produce energy any more

## INSIDE A POWER PLANT

A nuclear power plant must be safe, **otherwise radiation** could get into the air. They have a **containment** - a building around it that is made of **concrete** and steel. In the **core** of the reactor uranium is formed into long **rods** which are put into water. This water cools the rods when they get too hot.

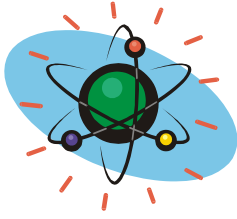
Control rods are also put into the core. They take up the neutrons and control the chain reaction. They can be **raised** or **lowered** into the core. If you raise them the chain reaction goes on quicker, the core gets hotter and more energy is produced. If you lower them they **absorb** free neutrons and the chain reaction is slowed down.



## DANGERS OF NUCLEAR ENERGY

Nuclear power plants have **advantages** because they produce electricity in a clean way. But there are also many problems

- + Natural uranium cannot be used in power plants. You have to **enrich** it. This costs a lot of money and is not good for our **environment**.
- + There is the danger of nuclear explosions. The explosion at Chernobyl in 1986 blew up the reactor's containment and tons of radioactive **dust** were blown into the atmosphere. Many people were killed and millions around the power station had to leave their homes.
- + **Used uranium** stays radioactive for thousands of years. There is no way to **store** it safely.
- + Transporting uranium is very dangerous.



# Nuclear Energy

**disaster** = a dangerous accident that kills many people

**finally** = in the end

**fuel** = material like coal or oil that you can burn to produce heat or energy

**fusion** = the central parts of an atom join together

**hydrogen** = one of the elements that make up water (H<sub>2</sub>O)

**join** = to put together

**near future** = very soon

**nuclear waste** = what's left over when energy is made in a nuclear power station

**nuclei** = the plural of "nucleus"

**recycle** = to use over and over again

**remain** = stay

**replace** = to use instead of something else

**reprocess** = the same as "recycle"

**shut down** = close down

## NUCLEAR FUSION

**Fusion** is the opposite of fission. The **nuclei** of small atoms are **joined** to make one bigger atom. The sun uses nuclear fusion of **hydrogen** atoms to produce light and heat.

Fusion is better than fission because it doesn't create that much radiation and you can use water as **fuel**.

## NUCLEAR WASTE

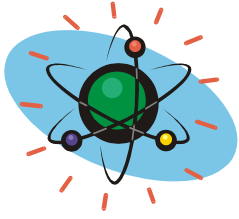
When the uranium in the core of a reactor is used up, you have to take it out. In some cases uranium can be **recycled** and used again. If you **reprocess** uranium you can make another dangerous product—plutonium, which is used to make atomic bombs.

But even though uranium can be used again it **finally** has to be stored safely. **Nuclear waste remains** radioactive for thousands of years. Even putting it deep into a mountain would not be completely safe.

## THE FUTURE

In the 1950s and 60s we thought that nuclear power was a clean and cheap form of energy. The energy companies thought that nuclear energy would **replace** coal, oil and gas.

But as time went on and **disasters** in Three Mile Island and in Chernobyl happened, people around the world saw nuclear energy as a danger. Some countries have already stopped their reactors completely and other are **shutting them down** in the **near future**.



# Nuclear Energy

**Belarus** = country in eastern Europe that used to be a part of the Soviet Union

**blast** = here :blow away

**cancer** = a very bad disease in which cells in a part of the body start to grow in an un-controlled way

**careless** = they were not careful

**constant** = always

**curies** = radioactivity is measured in curies

**disaster** = a dangerous accident that kills many people

**exposed to** = not protected

**fallout** = when radioactive dust moves around in the atmosphere and comes down in the form of rain

**height** = how high something is

**operators** = the people who are in control of the power station

**poison** = material that can lead to death

**routine** = something normal

## The World's Worst Nuclear Disaster—What Happened at Chernobyl

On 26th April 1986 the world's worst nuclear **disaster** took place at the Chernobyl nuclear power station in the northern Ukraine. One of the four reactors exploded because the **operators** were very **careless** about safety during a **routine** test. The explosion **blasted** a large hole through the roof of the building. Tons of radioactive material were blown up to a **height** of about 1 km. There was also a big fire in the station.

About 100 million **curies** of radiation escaped from the station into the atmosphere. Most of it fell on the farmland of **Belarus** and the Ukraine. A lot of **fallout** also drifted westwards to northern and central Europe.

The people of Chernobyl were **exposed** to radiation about 100 times greater than from the bomb that was dropped on Hiroshima. Since the accident, many hundred thousand people have become ill, a lot of them have died of **cancer** or other diseases.

Over 400,000 people had to leave their homes as a result of the explosion. The area around Chernobyl today is a radioactive desert and nobody is allowed to live there. The population of the Ukraine and Belarus is living in **constant** danger because the water is still **poisoned** and the ground on which they plant crops is still radioactive. The children are not allowed to walk in forests, play in parks or pick wild flowers.

