

Nuclear Power

Nuclear energy is a clean way to make electricity. It does not burn any fuel like coal so there are no pollutants released into the air.

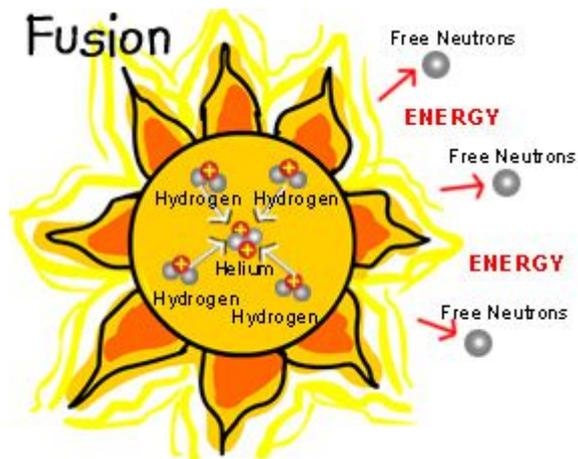
Nuclear energy is energy that is stored in the nucleus or center core of an atom. The nucleus of an atom is made of tiny particles of protons (+ positive charge) and neutrons (no charge). The electrons(- negative charge) move around the nucleus. The nuclear energy is what holds the nucleus together.

How it works

In order to use this energy, it has to be released from the atom. There are two ways to free the energy inside the atom.

1. Fusion

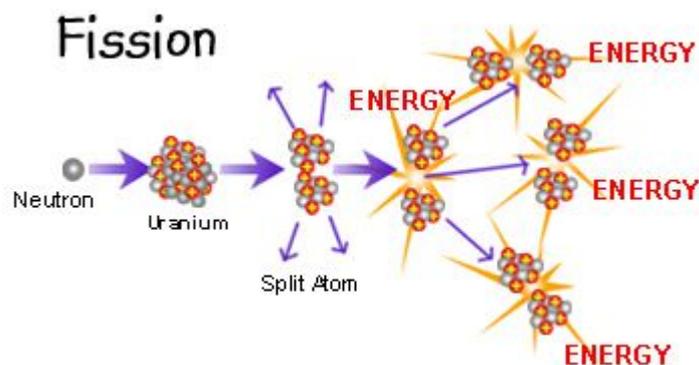
Fusion is a way of combining the atoms to make a new atom.



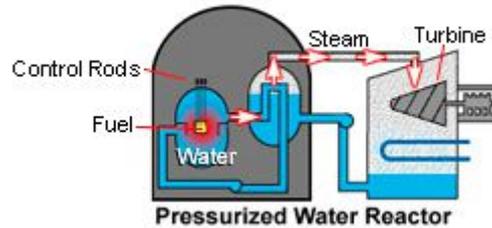
For example, the energy from the sun is produced by fusion. Inside the sun, hydrogen atoms are combined to make helium. Helium doesn't need that much energy to hold it together, so the extra energy produced is released as heat and light.

2. Fission

Fission is a way of splitting an atom into two smaller atoms. The two smaller atoms don't need as much energy to hold them together as the larger atom, so the extra energy is released as heat and radiation.



Nuclear power plants use fission to make electricity. By splitting **uranium** atoms into two smaller atoms, the extra energy is released as heat. Uranium is a mineral rock, a very dense metal, that is found in the ground and is non-renewable, that means we can't make more. It is a cheap and plentiful fuel source. Power plants use the heat given off during fission as fuel to make electricity.



Fission creates heat which is used to boil water into steam inside a reactor. The steam then turns huge turbines that drive generators that make electricity. The steam is then changed back into water and cooled down in a cooling tower. The water can then be used over and over again.

ADVANTAGES:

- 🌱 **Geographical limitations** - nuclear power plants don't require a lot of **space**; they do not need a large plot like a wind farm. But they have to be built near a **large body of water** for cooling purposes - using the water as a heat sink. They are usually found on the coast so there is no risk to drinking water sources.
- 🌱 Nuclear power stations do not contribute to **carbon emissions** - no CO₂ is given out - it therefore does not contribute to **global warming**.
- 🌱 Nuclear power stations do not produce **smoke particles** to pollute the atmosphere or emit gases that contribute to **acid rain**.
- 🌱 Nuclear energy is by far the most **concentrated form of energy** - a lot of energy is produced from a small mass of fuel. This **reduces transport costs** - (although the fuel is radioactive and therefore each transport that does occur is expensive because of security implications).
- 🌱 Nuclear power is **reliable**. It does not depend on the weather.
- 🌱 We can **control the output** from a nuclear power station to fit our needs. It is relatively easy to control the output - although the time factor for altering power output is not as small as for fossil fuel stations. It is said to have **along 'start up' time**. It cannot respond immediately to demand. That is why electricity companies try to 'even out' demand by using tariffs that encourage use at off peak time periods.
- 🌱 Nuclear power produces a **small volume of waste** (although that waste is radioactive - see below)

DISADVANTAGES:

- 🌱 Disposal of nuclear waste is very expensive. As it is radioactive it has to be disposed of in such a way as it will not pollute the environment.
- 🌱 **Decommissioning** of nuclear power stations is expensive and takes a long time. (In fact we have not yet decommissioned one!)
- 🌱 **Nuclear accidents** can spread 'radiation producing particles' over a wide area, This radiation harms the cells of the body which can make humans sick or even cause death. Illness can appear or strike people years after they were exposed to nuclear radiation and genetic problems can occur too. A possible type of reactor disaster is known as **meltdown**. In a meltdown, the fission reaction of an atom goes out of control, which leads to a nuclear explosion releasing great amounts of radioactive particles into the environment

GLOSSARY: