NUCLEAR POWER

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Nuclear power is generated using Uranium, which is a metal mined in various parts of the world. The first large-scale nuclear power station opened at Calder Hall in Cumbria, England, in 1956.Some military ships and submarines have nuclear power plants for engines. Nuclear power produces around 11% of the world's energy needs, and produces huge amounts of energy from small amounts of fuel, without the pollution that you'd get from burning fossil fuels. Nuclear power stations work in pretty much the same way as fossil fuel-burning stations, except that a "chain reaction" inside a nuclear reactor makes the heat instead.

The reactor uses Uranium rods as fuel, and the heat is generated by nuclear fission**:** neutrons smash into the nucleus of the uranium atoms, which split roughly in half and release energy in the form of heat. Carbon dioxide gas or water is pumped through the reactor to take the heat away, this then heats water to make steam. The steam drives turbines which drive generators. Modern nuclear power stations use the same type of turbines and generators as conventional power stations. In Britain, nuclear power stations are often built on the coast, and use sea water for cooling the steam ready to be pumped round again. This means that they don't have the huge "cooling towers" seen at other power stations. The reactor is controlled with "control rods", made of boron, which absorb neutrons. When the rods are lowered into the reactor, they absorb more neutrons and the fission process slows down. To generate more power, the rods are raised and more neutrons can crash into uranium atoms.

Natural uranium is only 0.7% "uranium-235", which is the type of uranium that undergoes fission in this type of reactor. The rest is U-238, which just sits there getting in the way. Modern reactors use "enriched" uranium fuel, which has a higher proportion of U-235.

The fuel arrives encased in metal tubes, which are lowered into the reactor whilst it's running, using a special crane sealed onto the top of the reactor.

Advantages

- Nuclear power costs about the same as coal, so it's not expensive to make.
- Does not produce smoke or carbon dioxide, so it does not contribute to the greenhouse effect.
- Produces huge amounts of energy from small amounts of fuel.
- Produces small amounts of waste.

Disadvantages

- Although not much waste is produced, it is very, very dangerous.

It must be sealed up and buried for many thousands of years to allow the radioactivity to die away.

For all that time it must be kept safe from earthquakes, flooding, terrorists and everything else. This is difficult.

- Nuclear power is reliable, but a lot of money has to be spent on safety - if it does go wrong, a nuclear accident can be a major disaster.

People are increasingly concerned about this - in the 1990's nuclear power was the fastest-growing source of power in much of the world. In 2005 it was the second slowest-growing.

Nuclear energy from Uranium is not renewable. Once we've dug up all the Earth's uranium and used it, there isn't any more. Actually, it's not that simple - we can use "fast breeder" reactors to convert uranium into other nuclear fuels whilst also getting the energy from it. There are two types of breeder reactors - ones that make weapons-grade plutonium and ones that are for energy production.

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