Renewable Energy

Renewable Energy

At the moment fossil fuels make up 95% of the world?s energy use. These are resources found under the gro
und: coal, oil and gas.

Trees breathe in carbon dioxide and store the carbon in their trunks. Thousands of years ago many trees s
ank into the swampy ground where they had been growing and disappeared, taking the carbon they had
absorbed with them. Under pressure from above, they turned in to a kind of fossil which we call coal! Now we ar
e digging it up to use as a fuel because the carbon which was stored in the fossils burn really easily. The s
ame thing happened with oil and gas except these were originally tiny sea creatures which stored the carbon
in their bodies and shells and took it with them when they died and their bodies got buried.

Without fossil fuels, many countries would not have been able to develop and industrialise to give us the
lifestyles which we enjoy today. Now more countries such as China and India are developing at a very fast r
ate and their energy needs are soaring.

The trouble is that when we burn fossil fuels to make electricity, run our cars and for many other uses the
carbon is released back into the atmosphere where it contributes to the greenhouse effect. These ?
greenhouse gases? such as carbon dioxide add to an invisible blanket around the earth which traps more of th
e sun?s heat. This makes the temperature of the world rise - what we call ?global warming?. The warming of the plan
et is causing the world?s weather patterns to change which is why we call it ?climate change?. Not only that but bre
athing in this pollution is not good for our health, especially in cities where they have a large number of cars
such as Mexico city! But there are still coal fired power stations being built around the world to meet our rising d
emand for energy to run all of our gadgets! World energy consumption increased by 38% between 1982 and 2
002 and it is predicted to increase by a further 15% between 2010 and 2030.

The other problem with fossil fuels is that they will soon run out - maybe that?s a good thing. So even if we don
?t agree with the idea of human induced climate change or don?t care, we still need to look for alternatives.

It is estimated that fossil fuels will last...

Oil - approximately 40 years,

Gas: approximately 60 years,

Coal: approximately 200 years

..... unless we find some more.

At the moment our problem is not that we don?t have enough oil, but that the demand for it is so great, we ca n?t get it fast enough!

Nuclear Energy

Natural radioactivity was discovered in the year 1896. From this came the idea of ?splitting the atom? or fissi on. This involves breaking up large atoms of a mineral called uranium to release their energy. Uranium is a na turally occurring material which was left over from the earth?s formation. Nuclear power does not produce any greenhouse gases which is a great advantage with the current climate change crisis.

At the moment nuclear power represents only 2.2% of the world?s consumption but it is set to increase. Many wor ld leaders believe that this is the way forward, especially as they are under pressure to reduce the amount of pollution they produce in accordance with the Kyoto Protocol which came into force in 2005 and with agreements made at the 2007 Bali Climate Change Conference to reduce emissions even more. The first n uclear power station to be built in Western Europe since 1991 is being planned for Finland in their efforts to meet greenhouse gas emission targets.

The world?s first nuclear power station was built in Cumbria, England is 1956. Nuclear power makes up a qua rter of the electricity produced in the UK but this is likely to be reduced to only 4% by 2030 since most stations can only last about 20 - 25 years before they become inefficient or are considered unsafe.

About 2/3 of the radioactivity to which we are exposed is natural. When it is made artificially it can be used for m edical purposes, in archaeology to date relics and in industry to conserve food.

The technical bit

Fission is when we split an atom artificially by bombarding it with neutrons. We have to use uranium for this b ecause it is an element which is ?fissile? or unstable - we can break its nucleus in two by adding an extra neut ron.

This reaction creates a lot of heat and radiation - its the heat which we can use to make power. But it also r eleases more neutrons which will go and bombard other atoms to create more energy, and more neutrons and so on.... Its a chain reaction so we can get a lot of energy from it. That?s why the place where nuclear ene rgy is made is called a nuclear reactor!

Inside a nuclear reactor the heat created by splitting an atom is used to heat water just like in coal power s tations. The steam from the hot water is forced through turbines and their movement is used to generate electricity. The power it releases is huge. A lump of uranium releases 2 million times more power than a lump of coal the same size. The electricity produced does not need to be too expensive because its so efficient.

But nuclear energy is a controversial subject! There are many good things about it, but potentially it could c ause major problems and many people are afraid of this. Fission does not just create heat but also r adioactive waste.

Nuclear fission is highly explosive and can even be used to make bombs. Accidents are a major concern s uch as in 1986 when a nuclear reactor exploded in Chernobyl, Ukraine. This shows us what can happen w hen nuclear power stations are not constructed or maintained properly. The nuclear reactor is sealed inside a c oncrete and steel case to stop any radioactive gases form escaping. If it is looked after properly then coal p owered plants can release more radioactivity.

Mining uranium in the first place is not very clean. Then once the nuclear reaction has taken place, what?s lef t over is a lot radioactive waste which has to be disposed of somewhere safe. This has to be somewhere w here it can stay for thousands of years because that is how long it needs before it is safe to be near to it. At t he moment nuclear waste is buried in the sea inside sealed glass cases. Transportation is also a risky b usiness because if there was an accident the nuclear material could leak. If not handled properly radioactive w aste can cause cancer and other health problems. Some people think it is just not worth the risk.

What would be even better would be if we could master fusion Instead of splitting an atom, this is the joining o f two small hydrogen atoms into one helium atom. It?s not dangerous, but unfortunately at the moment we don ?t know how to do it! One other thing, it is estimated that uranium will only last about another 60 - 100 years. That is why we need to look back to harnessing the power of nature!

Renewable Energy

Renewable means that the energy won?t run out, unlike coal, oil and gas which will.

As fossils fuels become more and more expensive and harder to find, renewable energy will become cheaper as technology improves and the equipment is made on a larger scale. Unfortunately at the moment we don?t hav e enough renewable energy to replace fossil fuels, but hopefully that will change. Currently Britain only m akes 2% of its electricity using renewable sources. However, the British government aims to increase this to 1 5% by the year 2020 and all of the countries in Europe have a combined target of 20% renewable by the same date.

Wind Power

Wind comes indirectly from the sun. As air heats up it moves around the planet as wind. The power of the wi nd has always been harnessed by humans for centuries, whether it has been to power sailing ships, to turn the blades of a traditional windmill to grind grain for flour or to pump water. The first windmills appeared in P ersia about 200 years before Christ. It was not until a thousand years later that they appeared in Europe. It is fr om those early windmills that we got the idea of using modern wind turbines to create energy.

Wind turbines consist of 2 or 3 blades on the top of a tall pole which can be turned to face the wind. Behind t he blades is a turbine which is operated when the wind turns the blades. They need an average wind speed o f 25km per hour but can turn at over 100 mph! The turbine is connected to a generator and this is where the e nergy can be turned into electricity. A group of wind turbines is called a wind farm. There can be up to 100 tu rbines in a farm.

Wind power is one of the most popular forms of renewable energy. There are plans to increase its use but at t he moment it makes up only about 1% of the electricity we use in the world. There is no fuel involved so once t

hey?re up and running they make no air pollution. Of course fossil fuels are used to make the turbines in the fir st place out of steel, aluminium and concrete but the turbines can replace this amount of electricity after about 9 months of use. They can also be taken down without leaving a scar on the landscape.

There is no shortage of wind but you can?t guarantee from one day to another how much wind there will be so you can?t get rid of fossil fuel power stations all together. But what they do mean is that we don?t need to use fos sil fuels as much so they still reduce the amount of pollution that they give out. It is clean and produces no g reenhouse gases. In the UK wind farms produce twice as much electricity in the winter as they do in the s ummer, but it is in the when demand is highest too.

They are not particularly efficient yet - you still need lots of them to make electricity.

The turbines can be costly to maintain so at the moment the price of the electricity they produce is quite expensive but it should get cheaper. Denmark meets over 10% of its electricity needs through the use of wind t urbines and hope by 2030 to generate 50% of it. This gives more people jobs than fishing!

Wind turbines need to be put in windy places. Whilst sometimes this can be out to sea, this can be e xpensive. Other times it may be on a hill top or a wide open space where there is little shelter. Most of them ar e located away from highly populated areas in Cornwall and Wales. However in some remote locations in S cotland, wind turbines have been standing idle because they haven?t been connected to the national grid wh ich is where the electricity they produce needs to go in order to be sent to different towns.

Wind turbines can be 8m high and often cause disagreements as many people think that they are ugly and spoil the natural landscape. Others think they add to the landscape - how much of our landscape has been i nfluenced by man? ?Shadow flicker? is caused by the blades reflecting light and casting shadows as they move. This has been blamed as the cause of a few road accidents when it distracted the drivers. At night the ai rcraft warning lights also create some light pollution in otherwise dark areas. People found the old-fashioned t urbines noisy because they made a constant swooshing noise and have been blamed for giving people headaches. They are much quieter these days and it is said that coal-fired power stations would make the s ame amount of noise.

Wooded areas have to be cleared to allow the wind through and they sometimes use up farmland space but farmers can lease the land and they can still use the land to grow crops or graze their sheep and cattle. The c onstruction of wind turbines has occasionally caused landslides or sediment which could pollute rivers in the short-term.

Wind farms are said to kill birds, especially when they get in the way of migratory ones and birds of prey. T

here are similar worries over bats. However studies suggest that the amount of birds killed is negligible c ompared to the many other ways they could get killed as a result of human activity such as hunting and collisions with power lines and high rise buildings. In the UK there is estimated to be 1 bird killed by every t urbine each year, but as many as 10 million birds are killed by cars. The Royal Society for the Protection of B irds supports the sensible placing of wind turbines. After all the effects of climate change on birds? habitats and their feeding patterns could be far worse.

Wind speed is higher over open water so it is better that they be put out at sea where they are less visible too. The power is taken to land via an underwater cable. In fact the UK plans to use off-shore wind farms to ge nerate enough power to light every home by 2010.

Off-shore wind farms don?t get the usual complaints since they are placed about 5 miles out to sea where no-on e can see them. Studies are still looking into the effects of noise on sea mammals such as whales to see if it c auses them stress or scares away their prey. On the other hand the turbines? poles under the water could enc ourage natural growth of mini-reefs (in the same way as a ship wreck would) which would attract more aquatic life.

There are plans to build the world?s biggest wind farm of the coast of England. This time the objections come fro m the British Ministry of Defence who argue that it would make it impossible to spot low flying air craft on their radar.

Britain is the windiest place in Europe but is way behind many other countries in its use of wind power! The U K wants 10% of renewable energy to be made by wind farms by the year 2010. Some people are even doing i t themselves by placing mini turbines on their houses to reduce their electricity bills! See w ww.energysavingtrust.org.uk

Solar Energy

Without the sun we would have no life. The sun releases more energy in an hour than the world uses in an e ntire year! There is more than enough energy for all of us, but its power needs to be harnessed. Solar panels we re first used after the 1973 petrol crisis. Solar panels or ?photovoltaic cells? can be used to turn the sunlight direc tly into electricity. These can be on people?s homes or spread out over a large area such as in the desert. Mirr ors can be used to reflect the sun?s rays and direct them to one place. Energy created can then be stored in lar ge batteries for use at other times - for example, when it?s dark!

Solar heating panels can also be used on people?s homes to directly heat up water for washing and heating in the house. This works as water is pumped through pipes in the solar panel. The panels are black so that they ca n absorb more heat.

Solar power is a renewable form of energy and solar panels do not produce greenhouse gases. However to c reate them materials such as silicon are mined which can be expensive and cause environmental damage in the process. Solar power is most effective in sunny places like a desert and least effective where it is dark a nd cloudy. Unfortunately these are the areas where they will need hot water and heating the most - but they a re improving all the time so that they can even work on dull days. They are good in remote areas where it is di fficult to get electricity such as in remote parts of Africa and Asia. Camels in the Sahara desert can be used to c arry solar powered fridges. Inside are kept important medicines that needed to be kept cool. Solar panels are ea sy to maintain so once they are there they last a long time.

The panels are not very efficient yet so large areas are needed to create a relatively small amount of electricity. A solar power station the size of a city is needed to power a city and the power is not easy to store. Th ey cost a lot to make compared to the amount of electricity they will produce in their lifetime. They are 90% cheaper than when they were first used in the 1970s though. However they can be put on the roof tops of houses and no extra land is needed. They are easy to install, although expensive but would be on the roof i nstead of tiles. Countries like Japan have made the most of the sun with solar panels on 400,000 of their r ooftops.

Scientists are even trying to work out how to put solar power stations in space! The main problem would be h ow to get the power back to earth. In the meantime buildings can be designed so that they make the most of t he sun?s light and heat, building them so that they face the sun, with large windows.

Geo-thermal Energy

Geo-thermal means ?the earth?s heat?. Underneath the crust of the earth?s surface is a bubbling, hot thick layer of molten lava. Its the same stuff that comes out of volcanoes! If you go right to the core, the temperature is as ho t as the surface of the sun! Sometimes this heat escapes and heats water which is nearer to the surface of t he earth. There are hot pools in Chile in South America, Iceland and Yellowstone park in the USA. Many of th e pools are boiling but some of the cooler ones are safe to swim in.

If you were to go as little as 3m down you?d find the temperature of the ground stays a constant 10 - 16 de grees centigrade all year round. Geo-thermal heat pumps can be used underneath buildings to transfer the h eat from the ground or water into a building during the winter. In the summer they can do the opposite and p ut the heat from the building back into the ground! Cold water can be sent down in pipes to 2000 metres deep w here it can be heated to about 66 degrees centigrade.

In places where it is known that there is a lot of lava heat near the planet?s surface we can drill down and pi pe the steam or hot water up. This is used to drive turbines which generate electricity. This is what they do on th e Portuguese Azores Islands - islands which were formed by volcanoes. These power stations use up much l ess land than a coal powered station and emit 97% less sulphur compounds which are what cause acid rain. T hey are better at producing electricity for a longer time too.

Hydraulic Energy - The Power of Water

Hydro-electric Power (HEP) Dams

A dam is made when you block a river so that the water forms a lake behind it. Dams were originally used as a way to store water for humans and animals. The first one was built in 2900 in Egypt by the Pharoah Menes in 2 900 BC.

The water is released through pipes and turbines which turn and create energy which can be converted into electricity.

When a river is dammed land, including farmland and houses is flooded and the natural flow of the river is disrupted. This can cause plants and animals to die, for example salmon fish can?t get upstream to breed.

HEP dams are very expensive to build but once built they are very easy to maintain and reasonably efficient to run. Water is renewable and no air pollution is made. In the UK they only produce about 2% of electricity in th is way but this probably won?t increase.

Tidal Power

Rising and falling tides are caused by the pull of gravity from the moon on the sea. When the tide comes in t he water is held behind a barrier. When it is released, the water rushes back through turbines in the barrier. Hu ge long barriers are required which are expensive and complicated to build but once there they do last a long time and the energy they make is clean. The tides are regular so its a guaranteed way to produce electricity. H owever, they can spoil the natural environment.

Currently there is a great deal of debate over the proposed Severn Barrage in the south-west of England near to Bristol. It is reckoned that the 10 mile barrage could produce 5% of the electricity needs for England and W ales. However there is great concern for the unique eco-system there which could be destroyed by the dam. Th e RSPB highlight the 80,000 waterfowl which use the site as a winter feeding ground which would have to go elsewhere. There is already a tidal barrage in St Malo in France which has been working non-stop since 1965.

Wave Power

Waves are made when the wind blows across the sea. Water mills, like windmills have been around for many y ears. Rotor blades like those found on wind turbines can be placed underwater to do the same job. The first co mmercial wave farm in the world is being developed by Portugal.

It is quite difficult to convert this power into energy. A British designer invented the ?Salter Duck? to make elect ricity. These nodding devices bob backwards and forwards with the waves, turning mini-turbines. Devices ha ve to be made strong to withstand storms and corrosion from the salt water, which means that they are very expensive to make. However once they have been built then they are very efficient - there are always plenty of waves!

Biomass Energy

This is a fancy way of saying something which we are all quite used to - burning wood on a campfire. But b iomass fuels can be any plant or animal material. Rape seed is one type of plant used and in the deserts of north Africa, camel dung is used to burn as a fuel. There?s certainly plenty of biomass about, although gr owing some plants for fuel might use up space where food could be grown.

Biogas

This uses animal and plant waste (poo and compost!) to create energy by allowing it to rot in a sealed container. As it rots, the bacteria gives off lots of gas, which is mainly methane. Methane burns well and is us ed in power stations and for small household uses like cooking and heating. It is cheap, easy to produce and u ses up waste from farming but carbon dioxide can be released into the atmosphere at the same time and methane is explosive.

Liquid Hydrogen

Liquid hydrogen can be made by passing electricity through water. This could be the future fuel for our cars. So me already run off it or a mixture of hydrogen and petrol.

It is clean, renewable and very effective but you still need electricity to make it which could come from a non-renewable source!

Some links:

www.planete-energies.com

www.energysavingtrust.org.uk

www.bbc.co.uk/climate/adaptation

www.therenewableenergycentre.co.uk

www.bwea.com/ref/faq.htm