

Future Fuels

Slide	Script
1	<p>This is one of a series of presentations from the Energy Institute that look at energy and energy engineering.</p> <p>In this presentation we look at some of the energy sources that may be used in the future.</p> <p>Please click the mouse button to start the presentation.</p>
2	<p>Harvesting the sun's energy is a great way of reducing our dependence on fossil fuels.</p> <p>Solar energy can be used in broadly two ways. It can be used to heat water, which is then used for space heating in buildings. Alternatively, solar energy can be directly converted into electricity using photovoltaic panels. We will look mostly at photovoltaic panels.</p> <p>The slide shows two building, both in Manchester, that have had hundreds of photovoltaic panels installed.</p> <p>One of the first things that is striking about photovoltaic panels is the sheer scale of coverage needed. Currently panels of one square metre will generate around 180 Watts of power. The Co-op tower, shown here, has 7,000 panels covering an area of 400 square metres. This is calculated to save around 100 tonnes of carbon dioxide emissions per year.</p> <p>Currently in the UK, there is about 13Megawatts of electricity generated by photovoltaic panels. They do not need bright sunlight to work but efficiency does fall if their surface becomes dirty.</p> <p>Countries such as Portugal, where there is more and brighter sunlight, are installing large solar panel arrays to generate much greater amounts of electricity by this method.</p>
3	<p>One of the most established renewable energies in the UK is wind power. The slide shows information from the British Wind Energy Association. It shows wind farms operational in the UK at December 2008. More turbines are being installed and many of these are now in offshore locations.</p> <p>Installing turbines offshore has two main advantages. Primarily, an offshore location has a more consistent wind flow. This allows the turbines to work more efficiently. Also, offshore locations tend to attract fewer objections when developers submit their proposals for planning permission.</p> <p>On land, wind farms are often situated in rural locations and new developments can attract many objections.</p> <p>Wind turbines located in urban environments tend to be inefficient as the buildings produce a disturbed and turbulent flow of wind. This is not very suitable for the turbines.</p>

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4	<p>There are several different technologies that are being developed to harness the power in waves and tides.</p> <p>Two technologies utilise the motion of the waves. Buoys are tethered to the sea floor and convert their up and down movement into electricity. This is achieved by compressing hydraulic fluid as the buoy moves up and down. Compressed fluid forces through a turbine which in turn generates the electricity.</p> <p>A more successful use of wave power is through long sausage-like structures called pelamis. These are 120m long and are articulated along their length. As a wave passes, the sections move up and down and this drives hydraulic fluid through turbines which turn generators. Each pelamis can generate around 750kW of electricity. A large wave farm, using pelamis, has been installed off the coast of Portugal.</p> <p>Another approach is the development of underwater turbines like these shown in the picture. The turbines are turned and electricity is generated as the tide passes back and forth. Tidal turbine technology is behind that of wind turbines but in the future, tidal power may supersede wind power as the tides are more consistent and predictable.</p> <p>Using the movement of water is an old form of power generation. River hydro power has been used for many centuries to drive water wheels. Modern installations are now returning to this power as a source to generate electricity.</p>
5	<p>Hydrogen fuel cells are being developed as portable sources of electricity.</p> <p>The essential reaction that happens inside a fuel cell is the splitting of hydrogen. This produces a hydrogen ion and an electron. The electrons form an electric current and are reunited with the hydrogen ion as it combines with oxygen to form water as a waste product.</p> <p>Hydrogen fuel cells may be used in vehicles or small devices such as laptop computers. Using methanol as a fuel, they work at low temperatures and produce up to 150W per cell.</p> <p>Larger hydrogen fuel cells, called solid oxide cells, can produce greater power. They work at high temperatures and currently produce up to 250kW per cell. They are suitable as combined heat and power sources for self-contained buildings like office blocks and hospitals.</p>

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6	<p>There are broadly two types of bio fuels. Both are plant-based. As the plants have taken in carbon dioxide to produce the source of the bio fuel, the carbon dioxide emissions associated with using the fuel are less than if fossil fuels were used.</p> <p>Fuels like bio ethanol are obtained by the fermentation of plant-based carbohydrates, such as sugars and starch, into ethanol. This bio ethanol can then be mixed with petrol and used as a fuel.</p> <p>Bio ethanol was originally produced using food crops such as maize and sugar beet. The trouble with this is that with the increase in demand for bio fuel, means that food crops have been diverted away from people and into the production of fuel. Food becomes more scarce and its price rises. Newer processes are being developed that is able to use the non-food part of the crop. They are able to use the cellulose, or woody parts of the plants, for fermentation.</p> <p>Biodiesel is obtained by blending vegetable oils such as palm oil with diesel obtained from crude oil. Again, diverting large areas of land to the production of plant oils for fuel has diverted food production. In some areas rainforests have been cleared to plant palm oil plantations.</p>
7	<p>Gas to liquid is not strictly a new fuel. It is a way of exploiting an already existing fuel.</p> <p>There are large reserves of natural gas but these are not easy to exploit as it is relatively difficult to transport a gas in large quantities. To overcome this, the gas is combined to form longer-carbon chain molecules which then form a liquid. This is easier to transport and can be used to make fuels such as diesel, for internal combustion engines. By it's nature, this fuel contains less sulfur and so is cleaner than diesel from crude oil.</p> <p>The gas to liquid process allows greater exploitation of natural gas reserves. It can also be used to minimise wastes from refineries by converting gaseous wastes into valuable fuels.</p>
8	<p>We hope that this presentation has been useful and informative. Please have a look at the other presentations on the web site that deal with energy and energy engineering.</p>