

## ENERGY FACTS: SOURCES OF ENERGY



- **Electricity** is found in nature, such as lightning. Electricity is produced by electrons, the tiny particles that "orbit" around the edges of atoms, from which everything is made. Each electron has a small negative charge. When electrons move, they carry electrical energy from one place to another. This is called current electricity or an electric current. Batteries also supply electric current. The electricity or electrical energy we use today was converted from other energy sources, mostly fossil fuels.
- **Fossil Fuels** are produced from the remains of plants and animals. Ancient plants absorbed the energy from the sun during photosynthesis. When the plants and animals died, their remains collected under mountains of earth and, over millions of years, they formed the fossil fuels - coal, oil and natural gas. Most of the energy used by people today comes from these fossil fuels. But fossil fuels are limited in their supply, can cause pollution and are becoming more difficult to find.

Coal is the most important energy source and will continue to be an important component of Australia's energy mix in the future. It consists principally of carbon and was formed millions of years ago from the remains of vegetation that was submerged in swampy water, altering the pattern of decay. Coal is Australia's most abundant fossil fuel. Coal fuels over 80% of Australia's electricity generation and is essential for maintaining the quality of life in the nation today. Burning coal can produce emissions of sulphur and nitrous oxides and results in carbon dioxide being released into the atmosphere.

Emissions from burning coal need to be reduced further if society is to meet growing energy demands and respond to climate change. New technology that can capture and store CO<sub>2</sub> deep underground, often referred to as 'clean coal' technology, offers a way to reduce greenhouse gas emissions from coal-fired power stations. Projects such as Queensland's Callide Oxyfuel Project are demonstrating how emissions can be captured from power stations so they are not released into the atmosphere.

- **Water** is not an energy source, but the energy in moving water is used to produce mechanical energy. Water falling downhill can be used to run turbines, which generate electricity. This is called hydroelectric power. About 5% of the world's energy is now produced by hydroelectric power stations. Damming rivers to make hydro storage lakes can have huge impacts on the environment below as well as above the dams. Water is also used at gas and coal-fired power stations to help produce electricity. In fact, water is required by most types of energy generation, including hydroelectric, nuclear, coal-fired, geothermal and solar energy.
- **Wind** can be used to turn windmills and wind turbines, which generate electricity. Windmills have been used for centuries in many parts of the world to pump water or grind grain. Wind turbines to generate electricity have been used in Europe for many years and are now being more widely used in Australia.
- **Bio-energy** is a renewable source of energy produced when the sun's radiant energy is transformed into chemical energy by plants in a process called photosynthesis. It can be divided into two different forms. Biomass energy, which uses solid plant and animal waste and secondly biogas, which uses the methane produced when plant and animal material decompose under anaerobic (no oxygen) conditions. Bio-energy is used to generate electricity, fuel vehicles, and produce heat for industry.

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Using bio-energy does not produce a net increase in carbon dioxide in the atmosphere because the plants that produce it use carbon dioxide as they grow. Bio-energy contains only small amounts of sulphur and nitrogen (depending on the feed stock), so it does not produce the harmful pollutants that contribute to acid rain.

- **Biomass** includes material for plants. Plants get their energy from the sun through photosynthesis. When plant waste is burned, the energy is released in the form of heat. In the past many homes have been heated with wood-burning stoves. Agricultural industries, such as the sugar milling industry use the waste plant material from the milling operation to fuel their boilers which provide heat for their milling processes as well as electricity to power the mill and local community. This is known as cogeneration.
- **Biogas** allows us to extract energy from rubbish and other waste! Waste material, when it is decomposing, as in rubbish dumps and sewage stations produces methane gas, which can be used to fuel gas turbines for electricity production. Most waste-to-energy facilities produce enough energy to run the plant and sometimes supply additional power to the community. This is a small but growing source of energy.
- **Geothermal energy** results when ground water comes into contact with hot rocks underneath the earth. These pockets of boiling water under the earth's surface send steam to the surface. This steam can be used to drive steam turbines and generate electricity. Geothermal energy is considered a renewable source of energy. It is heat energy produced within the earth. It is continuously generated, primarily by the decay of radioactive elements in the earth's core. The most active, high temperature geothermal resources are usually found along major plate boundaries where earthquakes and volcanoes are concentrated. High temperature geothermal resources can be used to generate electricity. Geothermal plants drill wells to capture underground steam, which spins a turbine to produce electricity. Geothermal is a clean energy source.
- **Nuclear Power** comes from the radioactive ore uranium. It produces far more power per ton than any other energy source. Nuclear power does not contribute to air pollution. However, radioactive waste is hazardous to living things. Exposure to radioactive materials can result in mutations, illness or death. The drawback to using nuclear power is finding a safe place to dispose of the nuclear waste. About 6 percent of the energy used in the world comes from nuclear power. Australia has large reserves of uranium ore.