

The Environmental Protection Agency is Queensland's lead agency to promote energy efficiency, renewable power, and other initiatives that reduce greenhouse gas emissions throughout the state.



Renewable energy

Fact sheet
Hydro

CLEANER ENERGY

Hydro



Hydro power

Hydro power is generated from the movement of water resources such as permanent creeks and rivers. At higher ground, water has stored gravitational energy that can be extracted by turbines as the water flows down stream. The amount of power available from hydro depends on the "head" and the flow rate of the water. The head is the height difference between the inlet to the hydro turbine and its outlet. For example, water falling from a height of 10m (equivalent to a four-storey building), at a flow rate of 10 litres per second (about one bucketful per second), is capable of generating one kilowatt of power (enough to operate 25 large fluorescent lights).

Although hydro is not as widely available as wind or solar power in Australia, it is more reliable and has the potential to produce more power. Hydro power uses a well established and reliable technology and can deliver very high efficiencies.

Hydro technology

Modern hydro technology uses specially designed water turbines. Some turbines, such as the propeller type, the Francis and the Kaplan, operate at low heads of less than 10m. These "reaction" turbines operate completely immersed in water, in the same way that wind turbines work in air.

In a fast flowing stream or river with virtually no head, a submerged propeller driven turbine such as the Australian Tyson turbine may be used, often attached to floating pontoons.

In contrast, "Impulse" turbines such as the Pelton wheel, the Turgo and crossflow turbines operate well with high heads (above 10m). They use the force of a water jet striking the cups or blades on the turbine "runner" to power the turbine.

The scale of hydro turbines varies from household-sized machines of only a few hundred watts output, to large-

scale turbines several storeys high that produce hundreds of megawatts of power. The efficiency also varies from 30 percent for the smallest machines to 95 percent for the largest.

Micro-hydro

Micro-hydro systems are small scale (less than 100 kilowatts) and are built to supply the needs of a small community or even a single dwelling. Hydro power on this scale has regained popularity in the last couple of decades. Small-scale hydro schemes can be used to supply power in remote areas in developed and developing countries.

Most micro-hydros are “run-of-river” systems that divert water through a pipe or channel, direct it through a turbine then allow it to flow back out to the river or creek. Not all the water flow is diverted so that plant and animal life remain protected. The turbine and associated equipment are positioned to ensure the least possible environmental impact.

Unlike large-scale hydro schemes, there is usually no deliberate attempt to store water. Occasionally, a small reservoir is built into the scheme, created by a weir rather than a complete dam.

Micro-hydro turbines have many advantages over solar panels and wind turbines, including the ability to produce power 24 hours a day.

Modern remote area power supply systems, comprising a micro-hydro turbine, battery storage and often a supporting diesel generator, have been installed in many locations throughout Queensland. These systems supply power to farms or small, localised electricity grids. The power from the turbine is used to charge batteries for later use, and a regulator is required to control the charging rate.

An inverter is used to convert direct current (DC) to alternating current (AC) to power home appliances or for export to the grid.

Large scale hydro-electricity

In Australia, around 9.5 percent of electricity is produced from hydro-electricity, more than half of which is generated in Tasmania (1996 figures). The Snowy Mountains Scheme in New South Wales is also a significant producer of hydro-electricity.

Large-scale hydro-electricity plants feed power into the state or national grid. They can be started up and shut down in seconds, providing valuable peak load power. By contrast, coal fired power stations take several hours to cold start.

Renewable energy

Renewable energy comes from sources that are essentially inexhaustible such as the sun, the wind and the heat of the Earth, or from replaceable fuels such as plants. Prior to the industrial revolution, these sources were virtually the only forms of energy used by humans. During the past 150 years, modern civilization has become increasingly dependent on fossil fuels - oil, coal and natural gas. Fossil fuels form so slowly in comparison with the rate of energy use that they are considered finite or limited resources.

Using renewable energy can provide many benefits, including:

- making use of secure, local and replenishable resources;
- reducing dependence on non-renewable energy;
- helping to keep the air clean;
- helping to reduce the production of carbon dioxide and other greenhouse gases; and
- helping to create jobs in renewable energy industries.

Geothermal, solar, wind, hydro, biomass and wave are all examples of renewable energies



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