FUTURE SPARKS

CSIRO

FACT SHEET

Hydro-electric energy

What is hydro-electric energy?

The potential energy held by water stored at a height is available to be converted to kinetic energy when the water is allowed to fall. The kinetic energy of naturally flowing rivers may be harnessed directly, and accelerated in a “mill race”, although the achievable speeds and pressures are much less than for specially constructed dams and penstocks. The water evaporates (solar energy again) and rises high into the air where it can fall into the dam as rain.

How is it used?

Hydro-electric power stations are usually associated with water storage schemes to ensure that a reliable supply of electricity can be generated whenever it’s required. Mountainous regions are especially suited to hydro-electric power, for example the highlands of Tasmania or the Snowy Mountains, although run-of-river systems can involve multiple dams along the length of a river, as along the River Derwent. Household- or village- scale micro-hydro generation is also possible when there is a suitable stream nearby.

Hydro-electric energy presently supplies 4.7% of Australia's electricity, and will remain a significant contribution to clean-energy targets, partly because it can be stored and used when wind and solar energy may not be available. This can balance the variability of solar and wind energy without creating additional greenhouse gases. Indeed, the special value of the Snowy Mountains scheme nowadays is in providing balancing services, because its total electricity output is determined by water management needs as well as by the value of electricity generated. There are no plans for further major hydro-electric generators in Australia.

Challenge

The environmental impact of damming areas for hydro-electricity generation is large and irreversible. Entire ecosystems are destroyed, cultural sites can be flooded and at times humans also need to be resettled. Introducing new water storage has impacts on fish breeding, land use, and wildlife habitat, water flow, and river ecosystems. Interestingly, large fresh-water lakes are also significant producers of methane, a potent greenhouse gas, through the decomposition of plant matter.

Large hydro-electric schemes are also very costly compared to fossil-fuel generators.

Source: CSIRO CarbonKids Curriculum Unit, Sustainable Energy for All, pages 25-32

Acknowledgements

The Future Sparks educational materials project is being undertaken by CSIRO Education for Green Cross Australia.

These educational resources are designed to introduce teachers and students to Australia's use of 'clean energy' as one of the carbon dioxide mitigation options available for achieving significant reductions in atmospheric carbon dioxide emissions. Whilst not an exhaustive educational resource, it is intended to raise the awareness of school-aged students about our changing climate, clean energy practices and applications and the other alternative energy technologies that reduce greenhouse gas emissions.

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