

HYDRO

What is hydro energy?

Hydro energy uses a natural element, water, to create power.

How is electricity generated from hydro energy?

Hydro power schemes generate electricity from water, or hydro energy. They usually have four main components: dam, penstock, power station and trailrace.

Dam (or intake area): A dam collects large volumes of water for storage in a reservoir. The higher the water level in a reservoir, the more potential energy there is available for generation in future. A generator can be used to divert water from nearby streams, rivers and lakes to fill the dam.

Penstock: A penstock is the pipe which carries water from the reservoir to the power station.

Power station: In a power station, a turbine and a generator convert water into electricity. When water enters the turbine, the force and weight of the water turns the turbine blades. This rotates the generator and produces electricity. A hydro power scheme can have more than one power station. The Tongariro Power Scheme has two power stations.

Trailrace: A trailrace releases water from the power station back into a river, stream, or lake. It is a channel designed to remove surplus energy from the water and calm it down.

How much energy is created depends on the rate at which water flows and the height it falls from. The greater the height and the faster the flow of water, the more energy the turbine blades generate.

What are the advantages of hydro energy?

Hydro energy is a renewable form of power generation and is a very effective method of converting energy into electricity. Hydro energy produces little or no greenhouse gas emissions and the water is free.

What are the disadvantages of hydro energy?

Because hydro schemes use waterways to generate energy, building and operating these schemes can disrupt natural waterways and aquatic eco-systems.

The effects of damming rivers both upstream and downstream, e.g., the Clutha River and the Wanganui River, have significant impacts.

When rainfall is limited, hydro generation is affected. Continuity of supply is an issue with hydro energy which means we can't be entirely reliant on it.

How is hydro energy used in New Zealand?

Hydro energy generation is well established and is the most common way to produce electricity in New Zealand because of our many waterways and mountains. In the North Island, three hydro power schemes



(Tongariro, Waikaremoana, and Kourarau) produce a total of 499MW of power annually. New Zealand's total hydro-electricity capacity is approximately 65% of the total power generation.



HYDRO POWER SCHEME AT TOKAANU, NEW ZEALAND.
SOURCE: GENESIS ENERGY

ACTIVITIES

ACTIVITY ONE

Research one of the current or proposed hydro power schemes in your region. What are the costs and benefits or advantages and risks of the scheme? Consider social, economic, environmental and cultural factors.

ACTIVITY TWO

Selecting one of the following topics, write a brief newspaper article or letter to the editor:

- promote hydro energy generation, including the benefits of this type of energy source
- describe ways in which hydro energy can affect the environment
- explain why hydro energy is the most common form of energy generation in New Zealand.

ACTIVITY THREE BUILD A MODEL WIND TURBINE

Divide the class into four groups. Assign each group a component of a hydro power scheme (dam, penstock, power station, and trailrace). Have the groups draw and label their component.

Teacher display the components of the hydro power scheme together on the wall. As a class, discuss how electricity is generated from hydro energy.

ACTIVITY FOUR RESEARCH PROJECT

What impact is climate change in New Zealand predicted to have on hydro energy generation?

SUPPORTING RESOURCES

- Energy Efficiency and Conservation Authority: www.eeca.govt.nz
- Ministry of Economic Development: www.med.govt.nz
- Genesis Energy: genesisenergy.co.nz

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