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Hydro-electric Power Stations

The power of moving water is harnessed to produce electricity in a hydro-power station. By releasing water from a reservoir or by using the constant flow of a river to turn the blades of a turbine, electricity can be generated from this natural and renewable source. The four main types of hydro-electric power plant are discussed below.

High Dam

This type of plant uses the head of water pressure held in a reservoir behind a dam to provide energy for the turbines. Water falls through penstocks within the dam to a generator hall at its base. Electrical transformers and switchgear are often situated adjacent or downstream.

Penstock

Penstocks are wide pipes which carry water from a reservoir to the turbines in a generator hall. The reservoir is normally held by a dam at higher altitude, and water falls through the penstocks by gravity. A surge tower maintains the head of water pressure in the penstocks and can sometimes be seen uphill from the generator hall. White water flowing from the tailrace in front of the generator hall indicates that the turbines are in operation.

Pumped Storage

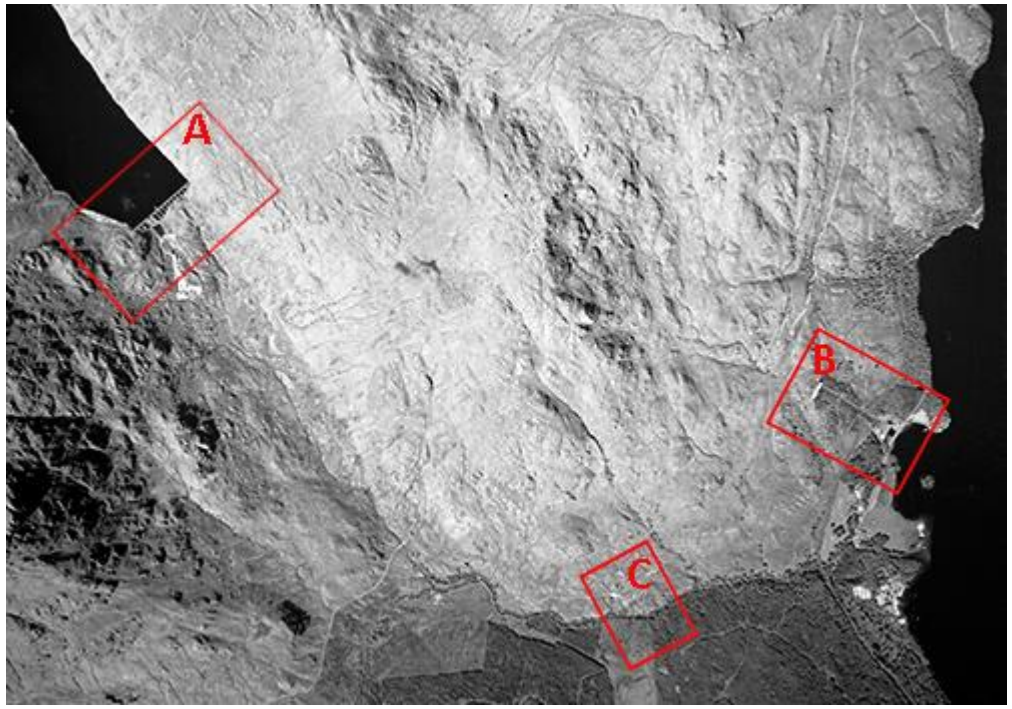
Resembling a conventional penstock system, a pumped storage plant uses cheap electricity at off-peak times to pump water from a lower reservoir to a higher one. At times of high demand, this water is released to flow back down the penstocks to generate more electricity.

In this image, the penstocks and generator hall are buried within the mountain but the tailrace and administration buildings are visible at the edge of the loch below.

Low Dam

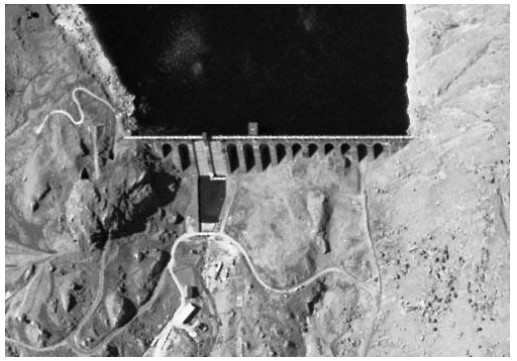
Low dams are situated across broad or deep rivers and electric power is generated from the steady flow of water through the turbines. A fish-ladder or boat lock can be incorporated in the scheme, adjacent to the dam, to allow fish to migrate and river traffic to pass.

Using the Loch Sloy plant as an example, some of the key elements of a hydro-electric power station are examined in more detail below.



A. Dam

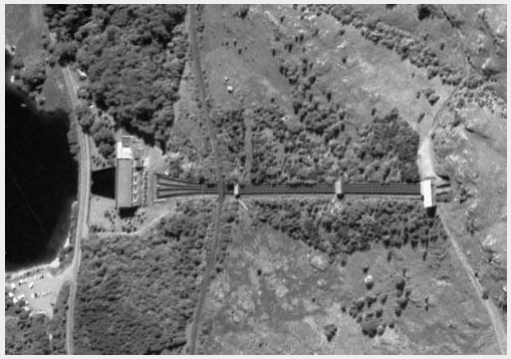
Valleys and canyons can be dammed to provide a reservoir of water for use in hydro-electric power schemes. The potential energy of the stored water can then be released into the penstocks as kinetic energy. Intakes near the top of the dam channel water into penstocks buried within it. A spillway enables excess water to be released from the reservoir in a controlled manner.



B. Penstocks and Power Station

Penstocks carry water from the reservoir, through tunnels under the mountain, before emerging at the valve house. Here, the flow of water is controlled and can be shut-off in periods of low demand.

In this image, the valve house is visible at extreme right, with four penstocks running downhill to the generator hall at centre left. Each penstock leads to an individual turbine within the generator hall. As high pressure water turns the turbine blades, they cause a connected copper rotor to turn within a series of magnets, producing electricity.



C. Distribution

Electricity generated at the power station must be immediately distributed to consumers across the country. Transformers step-up the voltage to 400Kv for efficient onward transmission. Normally, power lines are suspended from lattice towers, although they can also be buried underground.

In this image, a transformer yard is visible at centre right. Overhead power cables lead off to upper left through a break in a forestry plantation.