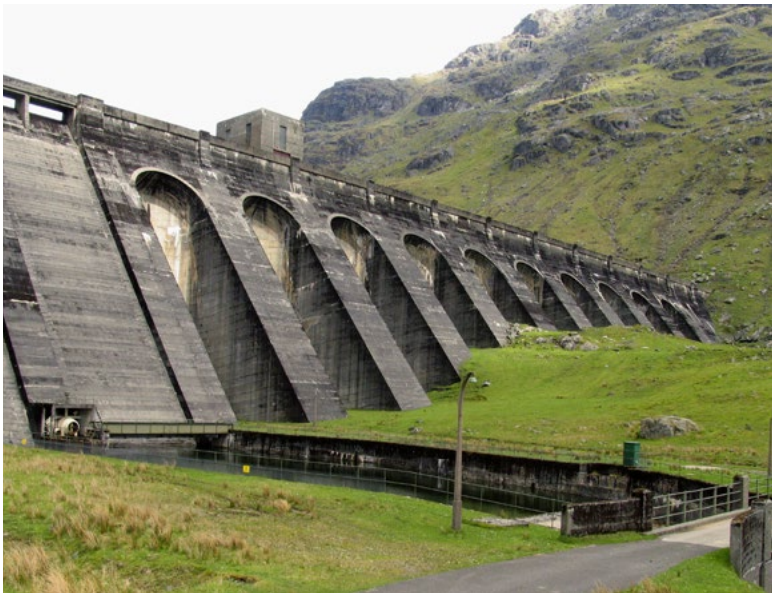
Renewable energy and biodiversity

THE IMPACT OF HYDRO ELECTRIC POWER DEVELOPMENTS ON THE LANDSCAPE AND BIODIVERSITY



Hydro Electric Power (HEP) generation involves the extraction of energy from moving water. The amount of energy generated depends on the volume and flow of water and water pressure.

The main types of hydro power generation are:

1. **Diversion (run-of-river) –** where a proportion of water is diverted via a weir or lade into a penstock (pipe) to a turbine (which generates electricity) before returning the water to the river downstream;
2. **Low Head** – run-of-river scheme that operates with a head of 20 metres or less;
3. **Impoundment** – where a dam or series of dams hold water back in flooded valley systems, creating a hydraulic head from which electricity is generated; and
4. **Pumped storage** – which uses similar principles to large scale impoundment but where a second reservoir is also used to pump water back into the first reservoir during off-peak hours. This provides a larger volume of water that can be used to generate electricity during periods of peak electricity usage.

The Loch Sloy Hydro Electric Power Scheme (above) on the west side of Loch Lomond is the largest of its type in Scotland, built in the 1940s. To make hydro-electric power you need an area with high rainfall and to be able to drop the water from a height on to a turbine. Water drops a height of 280 metres from the Loch Sloy dam down a series of pipes into the power station on the banks of Loch Lomond.

The power station can be at maximum power in five minutes (the time for the water to flow down the pipes to the turbines). The four turbines can produce 130Mw of electricity, enough to power 50,000 homes. The energy produced is a renewable source of electricity and does not create pollution in the form of greenhouse gases.

This location was chosen as this is one of the wettest areas in Scotland (annual rainfall is over 2500mm) and a hanging valley above Loch Lomond could be easily dammed to create a reservoir. The steep slopes of nearby Ben Vorlich allow rainwater to collect in the reservoir quickly and the hard, impermeable rocks provided excellent, sturdy foundations for a dam to be built on.

The main concern with the Sloy Scheme is the pylons and power cables which take the electricity generated to the National Grid. These can spoil the scenery, particularly when they run along hilltops and are easily seen. However putting these cables underground can often disturb important habitats and is very costly.

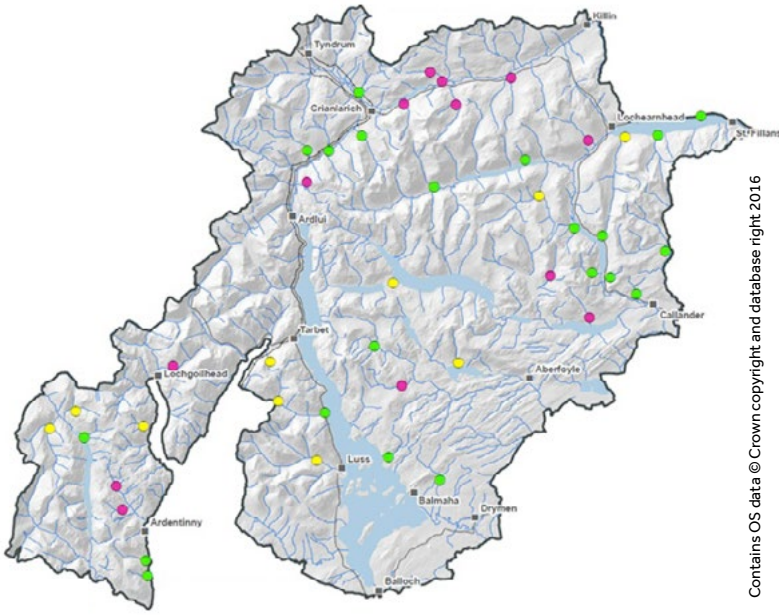
Water Supply

There are 22 large lochs in the National Park, many of these are very deep and are able to store large volumes of water. Loch Lomond itself supplies water to several towns including Helensburgh, Dumbarton and Balloch.

Glasgow's water has been supplied from Loch Katrine in the Trossachs since 1859. It is pumped 24km through a system of aqueducts and underground pipes to Milngavie Reservoir on the city's northern edge. Water from two neighbouring lochs, Loch Arklet and Finglas Reservoir, is piped to Loch Katrine to increase its catchment area.

Loch Katrine

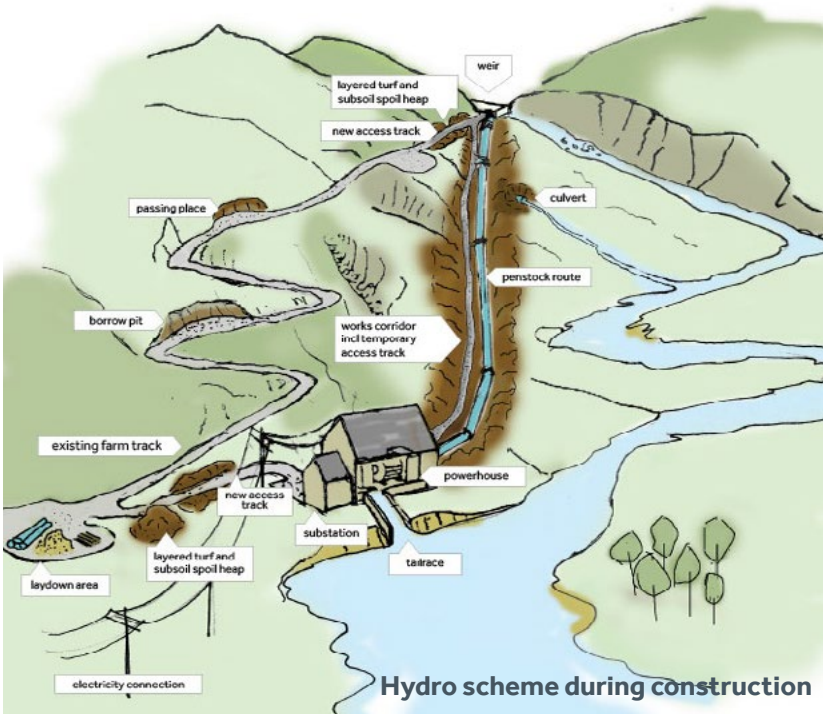
Loch Katrine is owned and managed by Scottish Water, a public organisation which supplies the whole of Scotland with water and sewage services. In 2004, work started on the Katrine Water Project, a £100 million scheme to upgrade the water supply to the 700,000 residents of the Glasgow area. Water quality now has to meet strict UK and EU quality standards, particularly for levels of bacteria. New treatment works and pipes will ensure Glasgow's supply is properly disinfected.



Renewable energy policy for the National Park

Small scale run-of-river technology is considered to be the most compatible to the National Park's geography and special qualities.

- Within the National Park there are 45 approved run of river schemes.
- 38 of these schemes are now operational
- 2 are currently under construction (February 2020)
- These schemes together provide enough power for 25,000 homes which is more than three times the number of houses within the National Park. It is also enough power to provide energy for Balloch, Alexandria and most of Dumbarton.



Hydro scheme during construction

Glen Douglas run of river Hydro scheme.

One of the first hydro schemes built this century is at Glen Douglas. Approval for the Construction of run-of-river hydro scheme (995kw) was given May 2008 with the works being completed in 2011. The location of the pipeline corridor through protected ancient woodland close to Loch Lomond made this a high profile project.

The route of the pipeline was carefully chosen so as to minimise loss of larger tree species. To further reduce the potential for damage to the woodland during the construction phase some additional mitigation was required which included:

- Ecological Clerk of Works present while putting pipeline through woodland,
- Use of geotextile ground protection to reduce damage by machinery
- Subsoil and top-soil separated during construction to aid vegetation recovery
- Woodland management plan in place for restoration after construction.

The intake where water is collected is very natural looking now. The stone preventing erosion of the river bank and the concrete weir that channels water into a pipeline has weathered and has integrated into the existing landscape.

Conflicting National Park aims

As a National Park Authority we regularly have to make difficult decisions over what is the best way to proceed. At the heart of these decisions are, sometimes conflicting, National Park Aims.

- To promote sustainable economic and social development of the Park's communities.
- To conserve and enhance the natural and cultural heritage of the Park

Resolution and role of The Park Authority

The National Park as a Planning Authority has the role of preparing and delivering the Local Development Plan. This identifies potential development sites and sets out policies to guide development that is needed in order to support our communities, visitors and local economy. Landscape is always an important consideration in these decisions.

Example of conflict resolution

The Local Plan provides support for small scale renewable energy development with a focus on supporting the National Park's communities and businesses. 'Small scale' can be defined as a development which has a low impact on the landscape, natural or built heritage, rather than its generation capacity.

Run of the river schemes up to 2MW are likely to provide the greatest opportunity whilst still considered to be small scale. Planning policy minimises the impacts from Hydro Developments by considering the key points:

- Engineering works - location, design or scale of the turbine house
- River profile - no decrease in stream flows reducing ecological value or visual attractiveness as a natural feature;
- Cumulative impacts on landscape, natural or cultural heritage, and the water environment
- Noise generation - residential amenity, protected species or tranquillity
- Pipes and power lines placed underground
- Recreation impacts - fishing, canoeing and kayaking access interests

All hydro schemes could potentially have an adverse impact on freshwater and terrestrial habitats and species. The ecological impacts from hydro schemes will often be site specific although impacts may be wider, for example downstream of the site.

The National Park Authority has an obligation to prevent any deterioration of the Park's high quality water resources under the Water Framework Directive. We also have a duty to consider impacts of changes to water flow on the important salmon rivers in the National Park.

Safeguards are put in place to protect fish populations to ensure they can still travel upstream and spawn in the gravel beds often found at the edge of hillside watercourses. Metal screens are placed at the end of the pipeline where the water is returned to the watercourse to ensure that otters do not enter the pipe.

Questions and pupil enquiry

- Why is Hydro favoured as the main form of renewable energy suitable for the National Park?
- What are the impacts of a hydro development on the landscape and water environment?
- What benefits do run of river hydro schemes bring to the land owner or local community?
- Multiple small scale hydro developments in an area could result in cumulative impacts on landscape, ecology, water quality and quantity, and recreation and access.
  Can you give examples of these impacts?

FURTHER GUIDANCE

Online

LIVE Park Renewable Energy Supplementary Planning guidance

NatureScot: Hydroelectric schemes and the natural heritage

Site visits [CS5]

- Callander Hydro (Callander Development Trust)
- Cashel Hydro (Cashel)