

Potential for the High Weald

There are many old mill sites and other historical features across the High Weald that have involved trapping water and producing a head of water, for example the bellows for smelting and the forges' tilt hammers. These heads were either created by a series of ponds or by damming ghyll streams. Many of these features still exist and offer potential for low head hydro systems.

There are also a number of main rivers including the Rother, Brede, Ouse and Medway crossing the High Weald running roughly east to west, as well as a number of tributaries. Also very characteristic of the High Weald are the narrow but often fast flowing ghyll streams. These watercourses also offer great potential for a variety of sizes of hydro projects. However great care and consideration needs to be given to designing hydro projects to ensure that they do not affect the 'naturalness' of water courses by affecting their flow.

Introduction

Hydropower is based on the simple concept of moving water turning a turbine which in turn spins a generator, producing electricity. Old mills can be used and useful power can even be produced from a small stream.

Water power is a combination of head and flow, both of which are required to produce electricity.

Head is water pressure, which is created by a difference in elevation between the water intake and the turbine (expressed in vertical distance or as pressure)

Flow is water quantity, expressed as volume per time. Design flow is the maximum flow for which the system is designed, it is likely to be less than the maximum flow of your stream, more than your minimum flow and a compromise between potential electrical output and system cost.

There are 2 kinds of system;

- 'Low' head – old mill sites with weirs and sluices
- 'high' head – fast flowing streams

How do I get an idea of how fast my watercourse flows?

An estimate of the flow of your watercourse can be found by consulting the National River Flow Archive (<http://www.ceh.ac.uk/data/nrfa/index.html>) on the Centre for Ecology and Hydrology website.

How much water do I need?

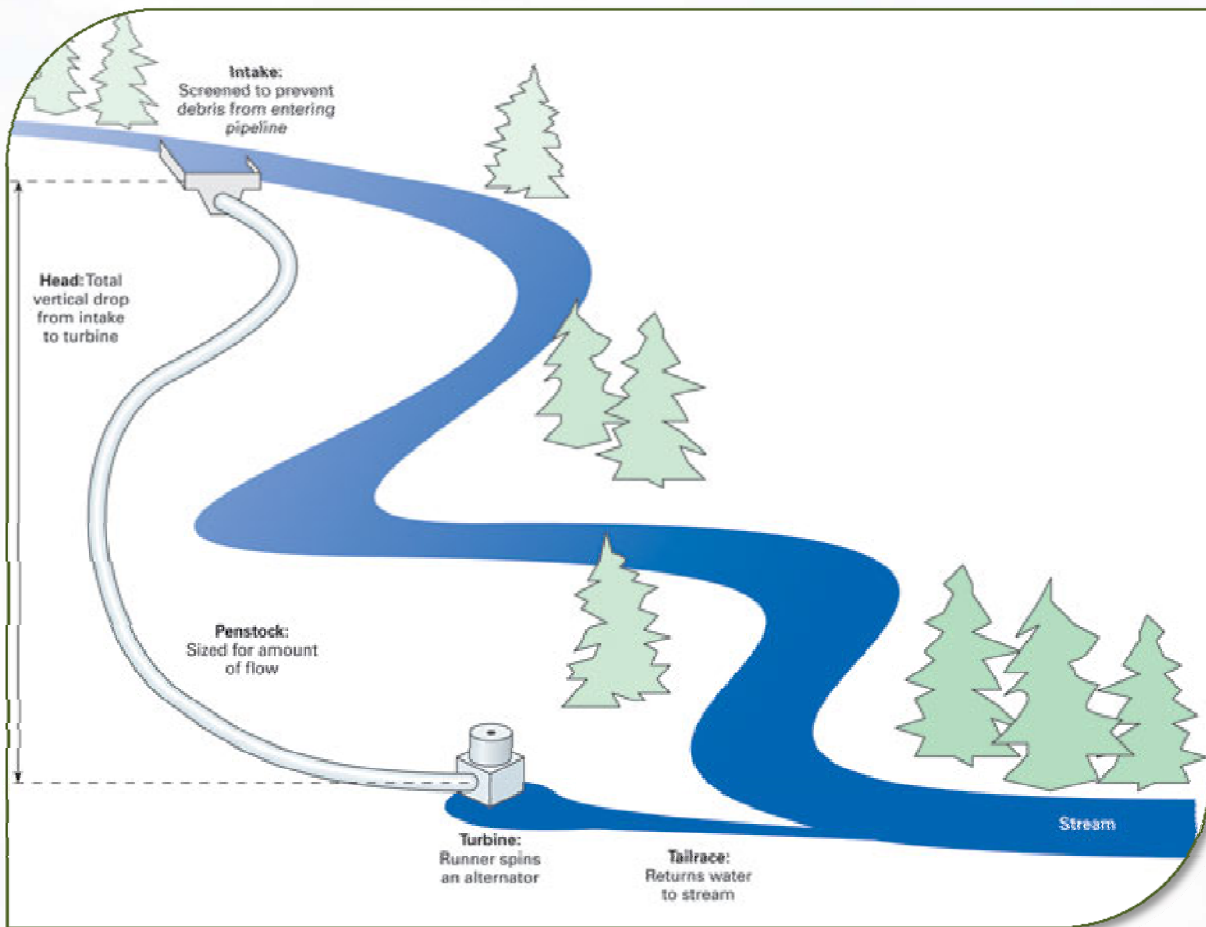
As a guide a stream with a flow of 15 litres / second, and a head of 15m will generate about 1kW, enough to meet the basic requirements of an average house.

What do I need to create a hydro system?

Components of a hydro system include:

- An intake, often incorporated into a weir, to divert the flow.

- A penstock pipe to convey the water to the turbine (the pipe should be sized to minimise 'head loss').
- A powerhouse
- An outflow, where the water is released back to the stream.



Can I sell excess power to the National Grid?

It makes more economic sense to use the power you generate yourself to directly replace what you would have normally purchased from an energy company (the price the energy company buys energy from you is usually about 2/3 of the price that they charge you!). Always shop around for the best deal, although you will have to buy and sell from the same company (combined supply and purchase agreement).

However if you are producing more electricity than you require any excess or unused electricity can be exported or sold to the grid via an export meter.

If your turbine is rated above 5kW, your local network may need to be strengthened in order to link with a high voltage supply. Costs vary depending on distance but are usually between £5000 and £10000.

Most reliable watercourses are likely to produce more power than you need, particularly at night, as flows are fairly constant all day long and your own demands go up and down.

For more information on [income from energy generation](#) see our website.

To calculate the [potential income](#) of your project use the online calculator on our website.

Can I create an 'Off grid' system?

Hydro is very well suited to creating energy in off grid situations, although consideration needs to be made for seasonal variation in flow and a backup system may be required at certain times of the year. If using an 'off grid' system the size and storage capacity of the batteries will determine what appliances can be run when there is no water flow.

Do I need to consider variation in water flow?

Allowances need to be made for seasonal variation in water flow and therefore back up power may be required, a typical system might be able achieve its full potential for 40 – 50% of the year. Therefore a 1kW system would provide 3504kW per annum at 40% - this is the approximate requirement of the average household.

Is there a good carbon payback?

Carbon payback is the amount of time it takes to repay the carbon that was used to make a product and is based on the carbon footprint of its manufacture.

Micro hydro systems are highly carbon efficient, unless a great deal of construction is required.

What about costs and maintenance?

This is a very specialist area and quality professional advice should be sought .

For low head systems, where a mill system already exists, capital costs would be around £4000 per kW, but would drop for bigger schemes of above 10kW.

Medium to high head schemes would have a fixed cost of about £10,000, and about £2,500 per kW, with a typical domestic scheme producing 5kW costing around £25,000.

Very small scale systems can be developed using micro – turbines mounted in small streams – these may cost around £700 per 100w, and can therefore provide energy for small off grid systems and charge 12-24v batteries.

Costs are high but often less than the cost of connecting to the grid, and provide a steady predictable supply better than other renewables.

The payback will of course vary depending on the efficiency and savings made.

Visit our website to use our [savings / payback calculator](#) or our [potential income calculator](#).

Once a project is established maintenance is minimal, with an annual service required for moving parts. However more regular cleaning may be required of screens to remove trash and ensure flow.

SWOT analysis

A SWOT Analysis is a strategic planning method used to evaluate the Strengths, Weaknesses, Opportunities, and Threats involved in a project or in a business venture.

<u>STRENGTHS</u> <ul style="list-style-type: none">• Very efficient renewable resource• Reliable and predictable• Generally produce lots of electricity• Good paybacks• Potential for high return on investment	<u>WEAKNESSES</u> <ul style="list-style-type: none">• Need a suitable water source!• Trash racks need regular cleaning• Specialist advice required
<u>OPPORTUNITIES</u> <ul style="list-style-type: none">• Can use historical features (mills etc.) to provide power• Can provide electricity at a range of scales from grid connected systems to 'off grid' battery systems• A system often provides more power than required, therefore great scope for selling excess• Often cheaper than grid connection• Scope for local electricity through a 'private' wire	<u>THREATS</u> <ul style="list-style-type: none">• Needs a suitable head, no good in flood• May require strengthening of the electricity network• Planning and Environment agency permissions requires

Planning Issues

Planning within the High Weald AONB

The High Weald Unit's role is to interpret government policy in the light of the AONB Management Plan (<http://www.highweald.org/text.asp?PageId=254>) and to provide advice to local authorities and others regarding planning applications. The Unit also responds to consultations regarding new planning policy at national, regional and local level, again based on the Components of Natural Beauty identified by the Management Plan. The Local Council is of course the responsible body as regards the exercise of planning powers.

Planning guidance (see below) actively encourages renewable development but makes allowances for designated areas such as the High Weald AONB:

In sites with nationally recognised designations planning permission for renewable projects should only be granted where it can be demonstrated that the objectives of designation in the area will not be compromised by the development, and any significant adverse effects on the qualities for which the area has been designated are clearly outweighed by the environmental, social and economic benefits.

Planning permission

Extracted from Planning and policy Statement (PPS) 22

<http://www.communities.gov.uk/publications/planningandbuilding/pps22>

Key features of a small hydro scheme include:

- a hydraulic 'head' - vertical distance from water source to the turbine.

- a water intake above a weir or behind a dam
- a pipe or channel to take water to the turbine
- a turbine, generator and electrical connection
- an outflow, where the water returns to the watercourse

The elements of a small-scale hydro electricity scheme create potential impacts on:

- landscape and visual amenity
- nature conservation
- the water regime.

These elements raise a number of important planning issues and planning permission will usually be needed.

Some form of environmental assessment is essential when it comes to applying for planning permission and environmental licenses.

Under the Town and Country Planning (Assessment of Environmental Effects) Regulations 1988, the planning application for any development that the planning authority considers likely to have a significant impact on the environment must be accompanied by an Environmental Statement.

This document provides an assessment of the project's likely environmental effects, together with any design, construction, operational and decommissioning measures that are to be taken to minimise them.

It would typically cover such issues as flora, fauna, noise levels, traffic, land use, archaeology, recreation, landscape, and air and water quality.

It should be noted that the Environment Agency must also be consulted about water extraction licences because the water is not owned by the landowner. This is not required if the site has 'Millers Rights'.

Information to accompany an application

A planning application for a hydro development could usefully include the following information:

- Maps, diagrams and drawings showing the location and design of intake, pipeline, turbine house, tailrace and security fencing and lighting for urban schemes
- Photomontage of intake.
- Grid connection works, including transformer and transmission lines.
- Provision for fish passes (where required);
- Details of vehicular access and vehicular movement;
- Landscaping provisions.
- Site management measures during the construction phase.

Building Regulations

If you wish to install a small scale hydro facility, building regulations will normally apply to aspects of the work such as electrical installation.

It is advisable to contact an engineer who can provide the necessary advice.

Contacts

District or Borough Council Planning Departments for the High Weald area:

Horsham: 01403 215187	Crawley: 01293 438787	Mid Sussex: 01444 458166 (main switchboard)
Tandridge: 01883 732859	Wealden: 01892 653311 (main switchboard)	Rother: 01424 787600
Hastings: 01424 783300	Sevenoaks: 01732 227000 (main switchboard)	Tonbridge & Malling: 01732 844522 (main switchboard)
Tunbridge Wells: 01892 526121 (main switchboard)	Ashford: 01233 637311 (main switchboard)	

Further Information

Planning Policy Statement 22: Renewable Energy –

<http://www.communities.gov.uk/publications/planningandbuilding/pps22>

Planning for Renewable Energy: A Companion Guide to PPS22 -

<http://www.communities.gov.uk/publications/planningandbuilding/planningrenewable>

High Weald Management Plan - <http://www.highweald.org/text.asp?PageId=254>

Useful contacts

British Hydro Power Association – www.british-hydro.org

National River Flow Archive – www.nwl.ac.uk/ih/nrfa/

Environment Agency – <http://www.environment-agency.gov.uk>

Centre for alternative technology – www.cat.org.uk

Renewable energy association – <http://www.r-e-a.net>

Carbon Trust – www.carbontrust.co.uk

Energy Savings trust – <http://www.est.org.uk>

Potential Grant sources

Low Carbon Buildings programme – www.lowcarbonbuildings.co.uk

England Rural Development Programme – www.seeda.co.uk

WARR partnership (LEADER) – www.warrpartnership.org.uk

High Weald AONB (Sustainable Development Fund) – <http://www.highweald.org>

Carbon Trust (Interest Free Loans) – www.carbontrust.org.uk

Enhanced Capital Allowance Scheme – www.eca.gov.uk