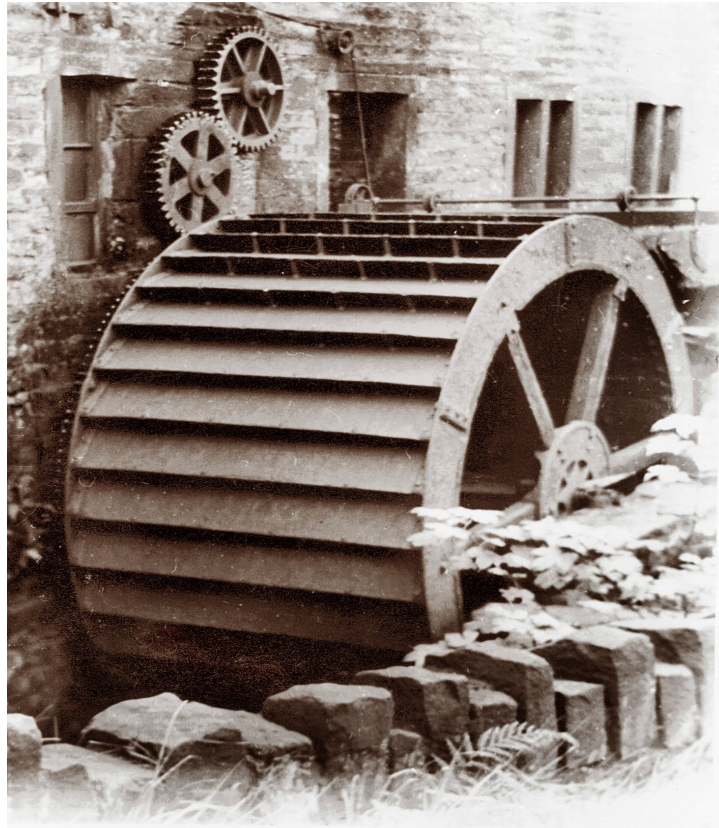




POWER FROM THE LANDSCAPE

Water power in the South Pennines

How to develop a micro hydro scheme



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1. OUR HERITAGE

From the earliest times, water power has provided a pivotal role in the development of the South Pennines; from the early corn and fulling mills to the growth of the early Industrial Revolution of the late 18th and early 19th centuries.

In the early 1800s water was powering upwards of 100 mills in the upper Calder Valley alone. From the 1840s onwards, it was used to complement steam power and was still being used in some mills well into the 20th century.

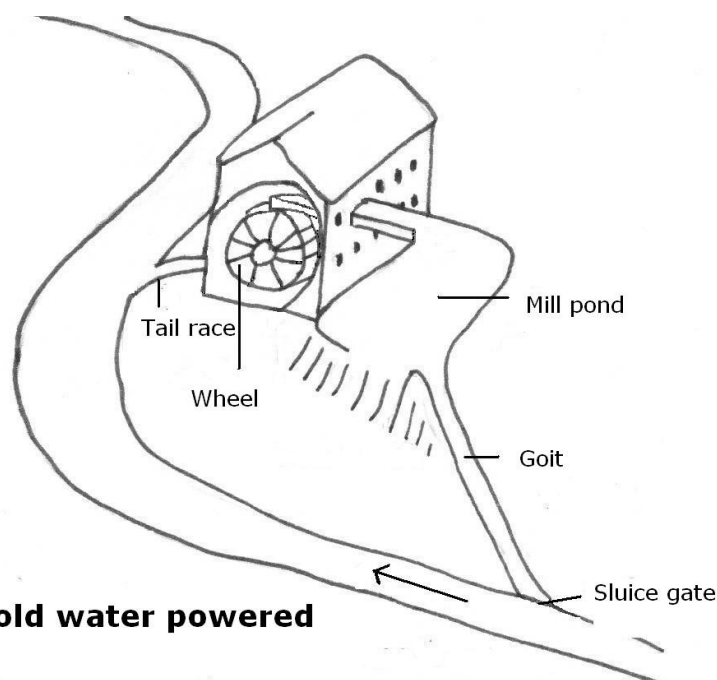
The evidence is permanently disappearing as the mills shut down, the mill ponds and goits dry up and the landscape changes back to its natural state. At present there are still small fragmented, tantalising clues to this not so distant past in the landscape itself.

Our energy needs now are far greater than in the past and water levels have dropped significantly, but new technology can be used to harness the power that once turned the waterwheels.

Power from the Landscape aims to make water power a common feature of the landscape once again. It has the potential to provide a useful contribution to the power mix of the area, and it is a clean, readily available, environmentally friendly resource, with great heritage and community value.

Whilst the earlier mills used water wheels to directly drive the machinery in the mill, today we would generally use water driven turbines to produce electricity.

For more information on the old water powered mills see [Power in the Landscape](#).



Typical old water powered mill site

2. INTRODUCTION TO MODERN HYDRO

Modern micro hydro has a number of advantages over some other renewable energy technologies. It can work at higher efficiencies and is more predictable – we can predict the general rainfall pattern.

The power produced will vary gradually day to day, rather than minute to minute. It is long lasting and robust – systems are engineered to last 50 years or more and it is a technology which is more acceptable by people. In most cases it has very little impact on the landscape and environment.

What is hydro-electric power?

Electricity is produced when a flow of water is channelled through a turbine connected to an electricity generator. Two factors are important – the head or height the water falls and the amount of water. These will determine the amount of energy which can be produced.

Hydroelectric schemes can be divided into two broad categories: large scale – more than 5 MW and small scale – less than 5 MW. In the steep sided valleys of the South Pennine catchment area, most of the streams are low/med head, low flow and will deliver below 100 kW.

Hydro systems can either be connected to the main electricity grid or as stand-alone (off-grid) power systems. In a grid-connected system, any electricity generated but not used can be sold to electricity companies. In an off-grid system, the electricity can be stored in a battery bank. For either system, the source needs to be relatively close to where the power will be used, or to a suitable grid connection.

When planning a hydro system, there are a number of issues that need to be considered:

- Identify whether there is sufficient potential energy output to make the system viable.
- That the owners of the land – including any land necessary to develop and access it - have been consulted.
- That there is an access point to either the National Grid or building that can use the power.

Anybody thinking of developing a site should seek independent professional advice before committing significant financial resources to the design and construction of a scheme.

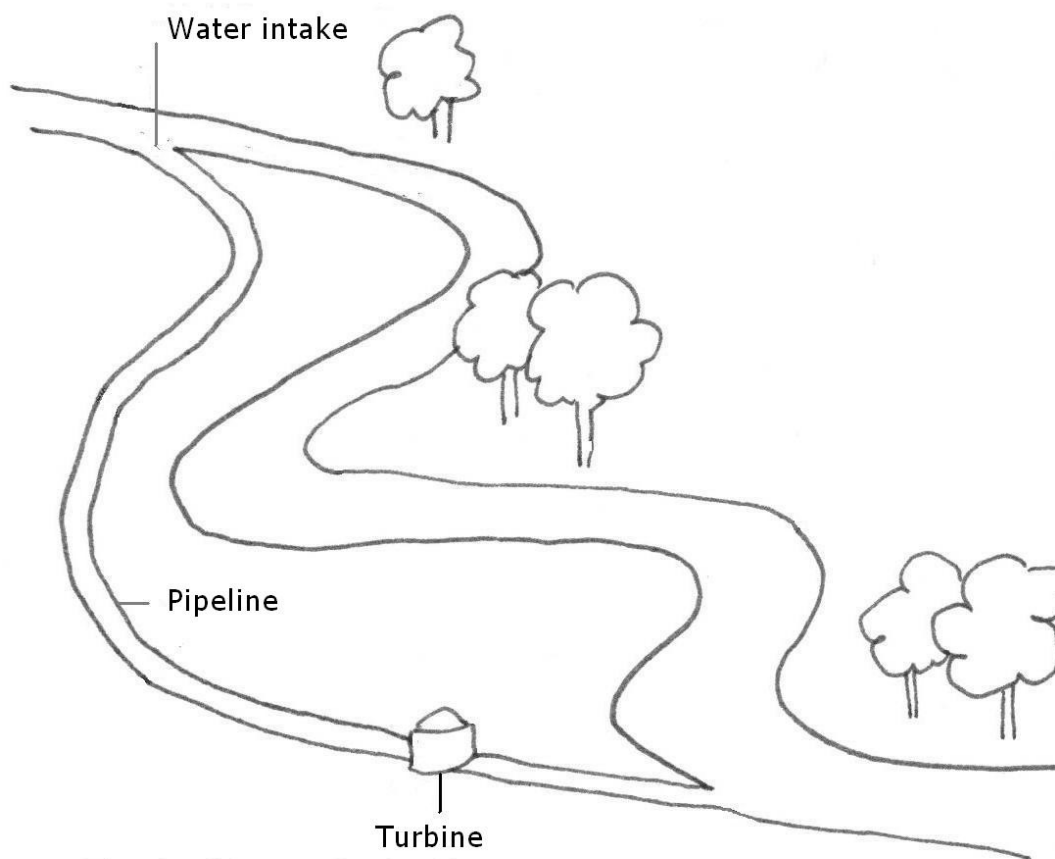
In total a scheme will comprise:

- An intake from the river, usually at a weir.

- A settling tank (or forebay' where any particles in the water are allowed to settle out. This usually has a rack of metal bars which filter out debris.
- A penstock, or pressure pipe, which takes the water from the settling tank to the turbine. Turbines convert the water pressure into mechanical power which is then used to drive a generator. These are housed, with the control equipment, in a suitable building.
- A tailrace which takes the water back to the river.

The electricity that is produced can either be fed directly into the grid, at a suitable point, or connected into a building that is close by the production site. For connecting to the grid it is necessary to talk to the Distribution Network Operator (a list can be found at the [PV-UK website](#)).

They will also provide an estimate of connection costs and the best location for feeding into their system.



Typical layout of a site

3. FEASIBILITY STUDIES

A pre feasibility study will provide an early indication of the viability of the site. It will include a site visit to get an understanding of the site layout and will establish whether it is suitable, with clear permission of the owners of the land, establish the head and flow and that there is a suitable access point for connection to the National Grid or place of use.

It will then be able to give an initial indication of the annual energy output and will provide enough information to be able to make the decision as to whether to proceed with the scheme.

For smaller schemes, this may be enough information for the installation to go ahead but larger more complex schemes will need a full feasibility study.

A full feasibility study will comprise

- a hydrological survey which will produce a flow duration chart using information gathered from rainfall records, local landscape knowledge and flow measurements. It will also look at the possible compensation flow (the amount of water that needs to be left in the river, after taking a supply for the turbine).
- a design of the full system including plans of the site, the civil works necessary for the whole installation, the type of generating equipment to be installed, information on grid connection, full costings, estimates of energy outputs and potential revenue - £/year.

It may also include an environmental assessment

The cost of a pre feasibility study will usually range from **a few hundred pounds to about £4000**.

Larger more complex schemes will need a full feasibility study which is likely to cost **£5000 - £10,000**.

Power from the Landscape is able to help with early feasibility studies for sites in the South Pennine area. Contact [Pete Hill](#) at Power from the Landscape for more information.

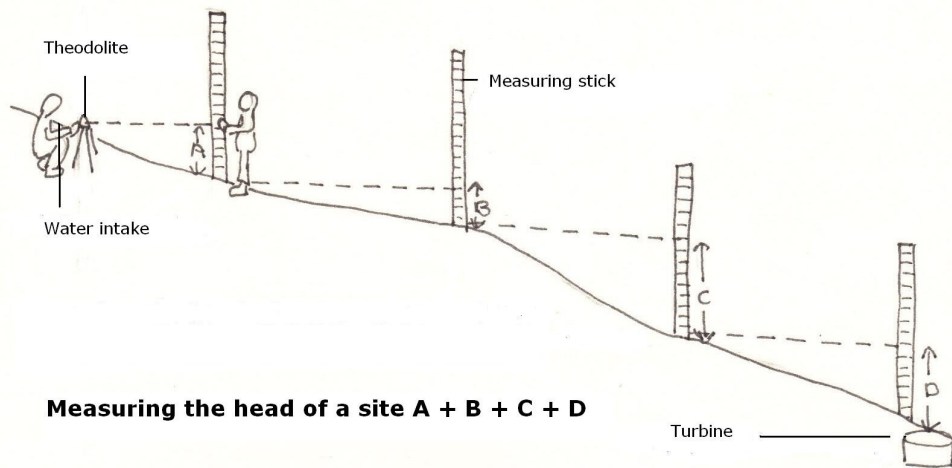
4. CAPACITY

To establish the potential of a site, the head and flow of the water need to be measured.

Head

The head is the height the water falls – taken from the point where the water will be taken from the river, to the turbine. Less than 10 metres is low head, 10 – 50 metres medium head and above 50 metres is high head.

With hydro it is very important to get as much head as you possibly can, as more head means more power for not much more cost. Depending on how much flow you have, the minimum amount of head required for a viable hydro system varies. If you have low head and low flow, then installing a hydro system won't be very cost effective. Typically a head in excess of 1m is the minimum requirement.



The head of water available can be determined by measuring the difference between the water surface at the proposed intake and the level at the point where the water will be returned.

There are various ways of doing this:

- From a large scale ordnance survey map, simply by counting the contours between inlet and discharge points – each contour is 10 metres. This is really only suitable for higher head schemes.
- A Theodolite or Dumpy or builders level is the usual method of measuring the height. This is an optical instrument used in surveying to measure or set horizontal levels.

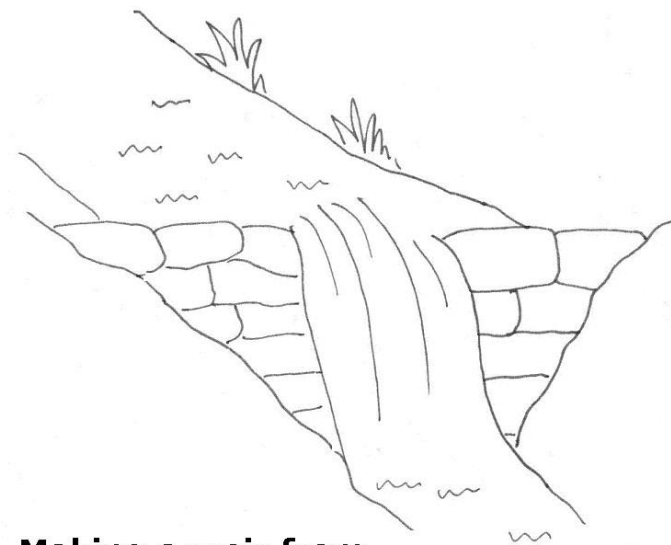
Flow

This is the volume of water which can be taken from the river and redirected through the turbine. It is usually measured in cubic metres per second but in small scale schemes, it is often measured in litres per second (where 1000 litres/second equals 1 cubic metre/second).

When taking water from a river, only a portion will be taken. This is so that the ecology and appearance of the river between the intake and outflow will not dramatically change. The amount of water left in the river is called the compensation flow. The Environment Agency will decide what this should be.

Obtaining the Flow Data

The Environment Agency has a number of gauging stations on the most significant rivers. A map of where these are, along with the data, can be seen at the Centre for Ecology and Hydrology's website at: www.nwl.ac.uk/ih/nrfa/. This information can be used to assess the flow rate at a given site.



Making a weir from sandbags to measure flow

If there is no gauging station near the proposed site, then there are other methods for assessing the information. The long term rainfall on the catchment area can be calculated or, the most accurate way is to measure the flow rate at the weir.

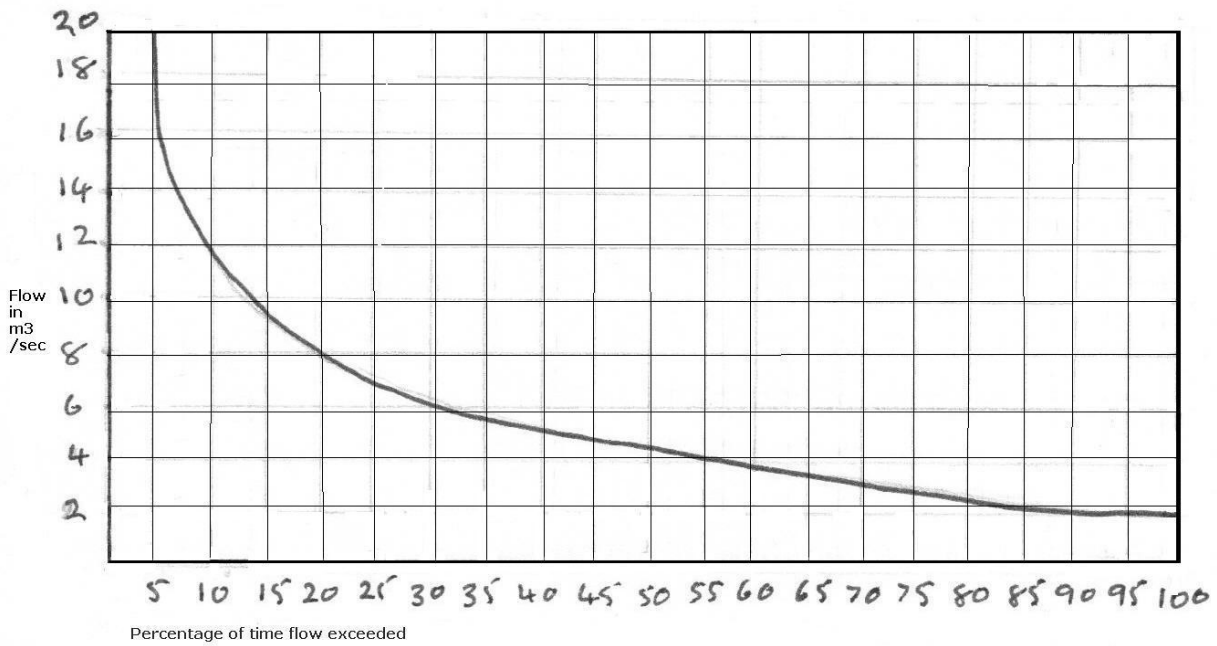
This can be done by constructing a "notched weir" and measuring the water which flows through it. It is possible to also use sand bags to construct a weir to measure from. Since the amount of water in a stream varies, then measurements should be taken over as long a

period of time as possible, in all conditions.

Flow Duration Curve

Once measurements have been taken, you can then calculate the "flow duration curve" – showing the variation of flow over a year. This will then show the level of flow exceeded for 95% of the year and will then be taken as the characteristic value of river flow at the site.

A flatter, rather than steeply sloping, line is better as it means the power will be more spread over the year.



Graph showing flow duration curve

Once these figures have been obtained, the maximum amount of power at a site can be very roughly calculated as:

Power (Watts) = Head (metres) x Flow (litres per second) x gravity 9.81 (metres per second).

A typical efficiency of a system is about 60% and so the figure should then be multiplied by this to obtain the final power potential.

Power from the Landscape can help with compiling flow duration charts as we now have the software needed to be able to calculate it. For details contact [Pete Hill](#).

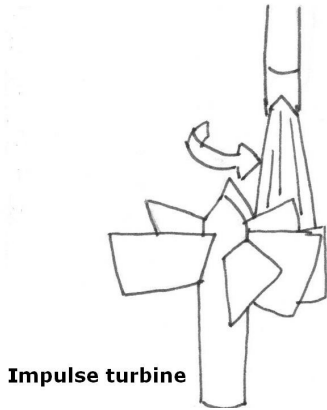
5. EQUIPMENT

What turbine to use

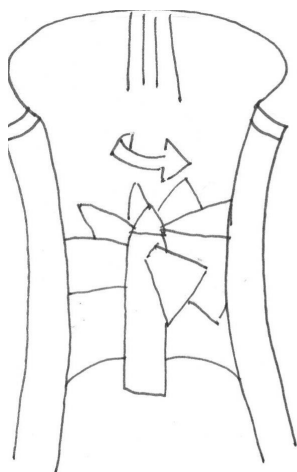
The turbine has to be carefully chosen so that there is a balance between a larger turbine that is capable of producing lots of power when the water is available, or a smaller, cheaper one which will generate less energy but work flat out most of the year. This is called the load factor. Normally you would choose one which had a load factor of 50% to 70%.

Turbines can be classified as high, medium or low head.

There are two kinds of turbine – reaction and impulse.



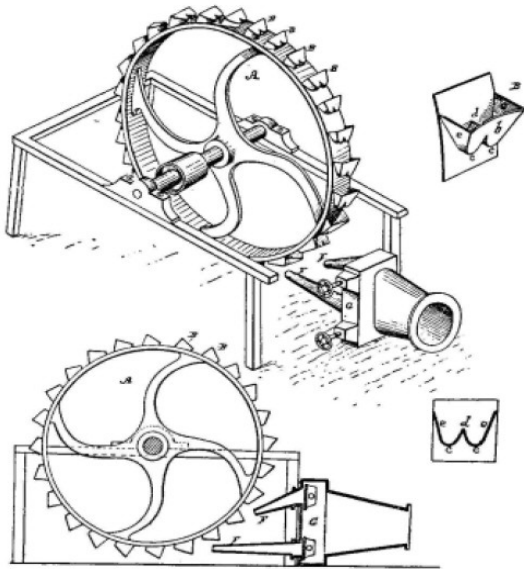
Impulse turbines are situated to spin freely in air and the water is directed at the turbine through a spout or nozzle. These are the most common sorts of turbine for micro hydro systems.



Reaction turbines are fully immersed in water and enclosed in housing, so that the pressure of the water turns the turbine. They are most likely to be used where there is a relatively consistent flow throughout the year. There are three types – Pelton, Turgo and Cross flow.

Reaction turbine

Pelton turbines are used for a low flow and high head. Turgo for medium head and flow, and cross flow are adjustable for variable flow. The Francis turbine was originally designed as a low head turbine and there were thousands of them installed across Europe in the 1920s – 60s. Many of them are still in existence and it is possible to get them refurbished.



Most hydro schemes will need at least a short run of pipe to bring the water from the river to the turbine. The pipe's diameter may range from a few centimetres to over 30 cms or more. Losses due to friction must be minimised and so the bigger the pipe the better. Plastic pipe (PVC) is the usual choice and it must be buried to keep the water from freezing and to protect it from damage.

Other equipment

Trash Screens

Perhaps one of the most important pieces of equipment is the trashscreen or trashrack. This filters out the debris from the river before it gets to the turbine. Most of the problems in a system can be caused by the screening system and so it is wise to get the best that you can afford.

A pool of water will not increase the output from the turbine, but it will allow the water to cal so any debris can sink or float.

In most cases the first line of protection is a boom which is laid across the river. This will catch large items. A rack of bars is then placed across the intake, which can be cleared with a rake. The distance between the bars will affect the head and so they need to be the maximum possible whilst still being able to stop debris entering the turbine.

Fish screens

In any river where the Environment Agency feel there is a threat to fish, they will insist on a by wash being established to enable fish to bypass the turbine system.

Where there are young salmon likely to migrate down stream, a fine mesh needs to be installed for several months in spring and summer. This will accumulate large volumes of debris which will need to be cleared frequently and an automatic clearer will be essential.

A number of innovative methods for excluding fish from intakes which avoid a fine-meshed physical screen are being trialled. They will be much more beneficial to the system as they will not reduce the flow of water, but are yet to find favour with the environment agency.

Automatic systems include

- A robotic rake. There are several designs but they usually involve rakes operated by a hydraulic ram. They are very robust but there are slight H and S concerns and the visual presence.
- A rake and chain clearer. This moves the debris into a channel to be flushed away into a side spillway.
- A grab and lift cleaner. This lifts the debris straight into a skip.
- Coanda screen. This is only applicable for high and medium head schemes require no raking because they utilise the Coanda Effect to filter out and flush away debris and silt particles. Precisely positioned, finely spaced horizontal stainless steel wires are built into a carefully profiled screen which is mounted on the downstream face of the intake weir. Clean water is collected in a chamber.

INSTALLERS

Installers will take the project through from specification, procurement, installation to commissioning of the scheme. They may also carry out a full feasibility study if required. A civil contractor may also be needed for the site work.

When choosing an installer, it is worth asking for references or a list of past projects that you could contact.

There is a list of approved installers at the [Microgeneration Certification Scheme \(MCS\)](#) website. This is a UKAS accredited certification scheme for installers and products, offering consumers protection. It is mandatory and will apply to all products from 1 January 2010.

6. PERMISSIONS

Consultation with the relevant authorities is crucial, at every stage, to any development. Early consultation will ensure that any problems are identified at an early stage. Relevant authorities could include the following:

Body to be consulted	Purpose
The Environment Agency (England and Wales)	To ensure that the site is acceptable To establish a design that is acceptable To identify the permissions required To discuss and agree an acceptable river operating regime (i.e. amount and timing of abstractions)
Relevant planning authority	To ensure that the site is acceptable To establish a design that is acceptable, especially where construction work is needed To identify permissions required
Fisheries bodies or those with an interest in fisheries (e.g. angling clubs).	To address possible concerns at the design stage
Statutory environmental bodies e.g. Natural England	To address potential environmental impacts at the design stage
Landowners	To address ownership, access and leasing issues, way-leaves for cables To address possible objections to development
Regional Electricity Company (REC)	If an electricity connection is required, to establish any design constraints and connection costs If appropriate, to enter negotiations for electricity sale

The Environment Agency

The Environment Agency have advised that, for small schemes, they are more likely to ask for a Transfer License instead of an Abstraction License, in recognition that smaller schemes only 'borrow' the water for a short stretch of river.

All license applications normally need to be supported by **an Environmental statement** which summarises the details and impacts of the scheme.

Schemes over 500KW are required by law to produce a formal Impact Assessment. This examines the likely effects the scheme will have on the

environment, showing how the scheme intends to minimise them. Typically it will look at flora and fauna, noise levels, traffic, land use, archaeology, recreation, landscape, and air and water quality. It could also possibly be needed for any planning applications.

The Environment agency may require additional information on water use and quality, fisheries, river ecology, flood defence, nature conservation and public recreation issues. They should be consulted at an early stage for guidance. If the issues are complex, specialist environmental consultants would be employed.

The Environment Agency may also require a **Section 158 Agreement** to be drawn up, which defines certain further details on the way the scheme must be operated in order not to conflict with the Agency's river management duties, e.g. rights of access, the control of river levels, flood waters, maintenance of the weir and river structures, etc.

The Environment Agency has published a Handbook which is available on their website at: http://www.environment-agency.gov.uk/static/documents/Business/Low_Head_Hydropower_August_2009.pdf

Planning

The planning department at the relevant local authority will indicate whether planning permission is needed, and also which other permissions and procedures need to be sought. They may also help with how measures could be implemented to make the development more acceptable. As always, an early approach is recommended to establish a good working relationship. They are likely to be concerned with:

- The visual appearance of the whole scheme
- Potential noise impacts on nearby residents
- Disturbance during the construction phase, both to local residents and disrupting traffic.
- Preservation of structures of historical importance

Sometimes it is advisable to apply for outline permission, first to establish the issues that are likely to arise, especially for larger schemes.

Fisheries

Hydro installations on rivers populated by migrating fish are subject to special requirements. Many of the rivers and streams in the South Pennines are of this type.

Installations must ensure that the fish cannot be taken into the turbine and that there is a water passage by-passing the hydro plant allowing the fish to pass. In the case of salmon, this should have some turbulent water as it is this which attracts the fish to jump

This may be a 'fish ladder' – a series of pools, that allow the fish to jump from one pool to another, or simply ensuring there is a suitable place in a weir.

Of particular note and concern, are the salmon and other species in the rivers of the South Pennines. There is now clear evidence that these fish are returning to the rivers, having been absent for over 150 years and every year will travel further upstream as obstructions are resolved.

It is an advantage to work with local river trusts as a well designed hydro scheme can support their aims.

Land ownership

You will need the permission of the landowner to build and have access to the powerhouse, intakes and discharge channels. Talking to the owner of the land should be one of the first things you do to avoid unnecessary work and to be able to negotiate any leasing requirements. Note that in exchange for being able to install a system in a river, a landowner can ask the developer to take on the maintenance of the whole weir any goits.

Land Drainage Consent, for any works being carried out within 9 metres of a 'main channel' ????

7. THE FINANCIAL BIT

Costs of a scheme

The costs of a scheme can be divided into four main areas:

Equipment this includes the turbine, gearbox and drive belts, generator and water inlet control valve. Generally, equipment costs for high head schemes are lower than those for low head.

Civil works

This includes any work on installing the equipment in the ground from river inlet to turbine and house, and then back out to the water.

Electrical system

This includes all the necessary electrical equipment – control systems, wiring, and transformer, but also connection to the electric. The cost of the latter is controlled by the local electric distribution company.

Other costs

These could include costs for design and project management, licenses, planning permission etc.

Example indicative costs for a small 100 Kw system could be - need costings for smaller scheme

	Low Head £1000s	High Head £1000s
Equipment	60 – 120	30 - 60
Civil works	30 – 100	30 - 80
Electrical system (not including grid connection)	15 - 30	15 - 30
Other	10 - 30	10 - 30
Total	115 – 280	85 – 200

Running Costs

These can include, any:

- rents payable on the land. If it is agreed with the landowner beforehand, then it could be possible to tie part of the rent in with the income from the property, so that the landowner has a vested interest in it being a successful scheme.
- metering services – monitoring of the meter by an external organisation. Metering is needed to calculate the total generation from the turbine, how much is being exported to the grid and how much imported.

Eventually, smart meters, due to be rolled out in all homes by 2020, will be used to measure the feed into the grid.

- business rates as hydro schemes are classed as businesses unless they are part of a domestic property.
- maintenance of the system. This should be very low for the first few years apart from routine inspections. As the system grows older then there could be costs replacing seals etc.
- insurance costs – should include material damage for the equipment itself, business interruption to cover for any loss of income,
- any public or employers liability

Financing a scheme

The initial capital outlay depends on the site but with the long lifetime of the equipment, high reliability and no fuel costs the running costs are very low. Initial capital costs can be substantially reduced when using pre-existing infrastructure e.g. at a former water powered mill site. Costs are lower for schemes with a high 'head' of water with costs increasing as the height decreases. There are several ways a scheme can be financed - grants, loans and investment from the community. Community projects work well as there are financial and other benefits such as increased buying power and sharing expertise.

Clean Energy Cash Back or FITs (Feed-in tariffs)

In April 2010, the Govt. is introducing the Clean Energy Cash Back scheme. This is a mechanism whereby there is a guaranteed fixed premium rate paid for electricity generated by renewable means.

Proposed tariff levels for hydro

Scale	2010-11 Tariff p/kWh	Annual change
<10kW	17.0	0
10-100kW	12.0	0
100kW-1MW	8.5	0
1-5MW	4.5	0

There will also be an additional payment, the export tariff, for every KWh that is exported to the grid. The suggested price for this is 5p/KWh.

This will go a long way to making systems financially viable and there is the potential for scheme to bring in substantial revenue into a community.

E.g. a 10 KW system, producing 10 KW an hour, every day for 365 days of the year will produce

.22p (17p +5p export tariff) x 24 x 365 = £19,272 per annum.

The tariff will be guaranteed for 20 years for projects established in 2010.
For more details of the scheme, see the [DECC website](#)

Metering requirements for FIT:

- total generation meter from micro-generation Technology
- export meter
- import meter

Grants

The Low Carbon Buildings Programme finishes in April 2010 with the introduction of FITs, www.lowcarbonbuildings.org.uk.

Some Councils offer schemes, such as Kirklees Council's Re-charge Scheme, which offers clients an interest free loan up to a max of £10k.
<http://www.kirklees.gov.uk/community/environment/RE-ChargeScheme.pdf>

VAT

The government reduced VAT for domestic and not for profit community organisations on the equipment for a hydro scheme. The installer will be able to advise on this. This does not apply to DIY installations.

The Co-operative Bank

The Co-operative Bank has a track record in funding a wide range of renewable energy projects, including hydro.

The renewable Energy and Asset Finance Team provided £61,000 to help fund the installation of a hydroelectric Archimedean screw at Rorr Weir on the River Gyt at New Mills, Derbyshire

The funding was provided to Torrs Hydro New Mills Ltd (THNM) a company specifically set up to own the scheme at New Mills and install the hydro plant.

Power generated from the Archimedean screw will ultimately be sold, through an electricity supplier, to the Co-operative Group. The electricity will be fed directly into a nearby Co-operative food store

[Charity Bank](#)

Charity Bank is the UK's only regulated bank that is also a registered charity. Using 100% of depositors' savings, they support voluntary organisations, social enterprises and charities to address society's needs and maximise their social impact.

[CO2 Sense](#)

CO2Sense can offer funding to encourage the development of new renewable electricity generation in the Yorkshire and Humber region.

The funding, known as the Grid Connected Renewables Programme, is available in three streams:

- Emerging renewable technologies. This includes new or existing technologies which are innovative or technologically advanced
- Flagship projects. This is to support projects which can become icons for the region
- Community ownership of renewables. This is dedicated support for projects which are owned by the community.

To be eligible, the generation must take place in the Yorkshire and Humber region and must be connected to the national electricity grid. The selection procedure will be competitive, and a key selection factor will be the quantity of CO2 savings per pound bid.

Funding is available from £20,000 – 500,000, and will be subject to the EU rules on state aid. It is important to note that all funding must be spent by March 2011.

[EON](#)

The Sustainable Energy Fund offers grants of up to £20,000 to community groups and not for profit organisations who wish to consider and implement sustainable energy projects in their buildings – from energy efficiency through to micro-generation. Projects that would be considered include: the purchase and installation of one or more renewable energy technologies or the renovation of existing facilities to incorporate micro-generation technology (e.g. the reinstatement of a watermill and the purchase of a turbine to produce hydro-electricity).

Application forms are available from the website.

[Scottish Power Green Energy Trust](#)

Established in 1998, the independent charitable Green Energy Trust supports the development of new renewable energy sources in the UK helping to reduce our reliance on fossil fuels and combat climate change. Funded by ScottishPower's Green Energy Fund customers and ScottishPower, the Trust offers grants to a wide range of projects that will increase our use and knowledge of renewable energy. The maximum grant is £25,000 for up to 50% of the project costs.

[EDF energy](#)

EDF Energy Green Energy Plan This fund is generated by customers of EDF energy switching to a green tariff. It supports the installation of small scale community renewable energy technologies. Potential applicants should contact the green tariff helpline for an application form and greater details concerning the application criteria. Grants of up to £30,000 are available.

[Community Sustainable Energy Programme \(CSEP\)](#)

The Community Sustainable Energy Programme will provide £8 million to community-based organisations for the installation of microgeneration technologies. Funding will also be available for energy efficiency measures, such as cavity wall and loft insulation in combination with the microgeneration technology. Where these are not already in place, you will have to install them in order to qualify for a microgeneration capital grant. The upper limit for installed capacity funded under this scheme is 50kW. It will also provide £1 million for project development grants that will help community organisations establish a microgeneration and energy efficiency installation.

Grants available are:

Capital grants of up to £50,000 for up to 50% of the project costs, whichever is lower.

Project development grants of £5000 or 75% of the project costs, whichever is lower.

8. LEGAL STRUCTURES

Introduction

There are a number of options available to communities in terms of legal structure. It is an important decision to make as it can restrict what your organisation can achieve if you chose the wrong one.

A legal structure is, quite simply, a formal method of organising a project so that it is acceptable in law. Different structures will determine the corporate status, governing document or constitution, your governing body, management structure, membership and how you will deal with any profit from your enterprise. There are several types of legal form available:

- Association
- Trust
- Partnership
- Company limited by guarantee and company limited by shares
- Industrial and provident society
- Limited liability partnership
- Community interest company (CIC) limited by guarantee and community interest company (CIC) limited by shares
- Charitable incorporated organisation (NB this is scheduled to be available in mid to late 2009)

Which form is appropriate for your organisation?

When considering which legal structure is most suitable for you, it is important to first work out what your aims and purpose and objectives are, what you want to do, how you want to do it, do a business plan and then choose a structure that is suitable for you, i.e. structure follows strategy, not the other way round.

First of all, you need to decide whether to incorporate at all – register as a company with Companies House or other body. Unincorporated organisations (such as Association, Trust or Partnership) have no legal identity separate from individual members. Members of its management committee will ultimately have personal legal and financial liability. In an incorporated company, members of the board have a limited liability – if everything goes horribly wrong then they are only liable to the amount of money they put in, a nominal sum - usually not more than £1. (That is unless they can be said to have acted improperly or outside the law, in which case they will be personally liable.)

Any organisation which intends to develop any substantial trading activity should be incorporated as it reduces the personal liability of the members. It is not as onerous as it sounds and is a very simple and quick process. A company can be got up and running in a matter of days.

The most common forms are

- company limited by guarantee,
- industrial and provident society
- community interest company

Limited Companies

This is the simplest form of incorporated company. Limited companies are owned and controlled by their members. They can either be a

Company Limited by shares.

This means that any profit will be shared amongst the members of the organisation. As the company grows, its profitability grows and so does the share price, so shareholders make money. The share model may be used by Social Enterprises that are employee-owned, but they will not be likely to attract any grants.

Company Limited by Guarantee.

Often called 'Not for profit organisations', it doesn't mean that the organisation cannot make a profit, simply that any profit will be reinvested into the company. Directors will be able to take a wage. This is the most common form for organisations such as this.

Industrial and Provident Society (IPS)

An IPS can take two forms – they qualify if they carry out an industry, business or trade and are either 'a bona fide co-operative society' or are intended to be conducted 'for the benefit of the community'

IPSs are registered with the Registrar of Friendly Societies under the Industrial and Provident Societies Act 1965.

The 1965 Act does not define what a 'bona fide co-operative society' is but the Registrar of Friendly Societies has issued guidelines which state that:

- Business must be conducted for the mutual benefit of the society's members
- All members must have an equal say in the running of the society
- A society that operates with the object of making private profit cannot be a bona fide co-operative society. Any surplus must be re-invested and the amount of interest members can be paid on the money they have invested in the society is restricted regardless of the level of profit.
- The society must have at least 7 members
- Membership must be open to all who work in the organisation

Community Interest Company (CIC)

This is a relatively new legal form and seems to be the flavour of the month at the moment. A CIC is not for everyone, it is just the newest of several options for legal structures for social enterprises. They are a sort of halfway house between a business and a charity.

Charity law is centuries old and people have been looking at modernising how they work and coming up with suitable structures that represent the needs of a

modern charitable organisation. There is more of a need for charitable organisations to be able to make their own money and charities as such are very restricted in this.

CICs were introduced to offer a modern recognisable form for social enterprises and those organisations wishing to carry out socially motivated objectives. They are based on a model used in America.

Like a Limited Company, they come in two forms – limited by guarantee or by share. A CIC must first be registered as a limited company. The key points of CICs are:

- they must have a lock on assets
- directors can be paid
- it is possible to access Equity Finance.

They cannot get charitable status, although charities can become CICs (but would lose their charitable status and any assets could not be transferred to the CIC).

A CIC must provide a 'Community Interest Statement'. This will show that everything it does will contribute in some way to benefitting the community. It considers how you will use any surplus and how you differ from a commercial company. Applying is a very simple process.

For any of these structures the key point is the 'asset lock'. This is a provision that must be present in the memorandum and articles, or constitution. It simply means that any assets of the organisation are locked within the organisation and can only be used to meet the objectives of the organisation, or passed to another organisation with similar aims and objectives. There can be no asset transfers unless at the full value market price, ie. things cannot be given away, unless you want to transfer to another asset locked body.

For more information:

National Council for Voluntary Organisations

Governance and Organisational Structures

www.ncvo-vol.org.uk

Community Interest Companies

www.cicregulator.gov.uk

Companies House

www.companieshouse.gov.uk

Voluntary Action Calderdale

www.cvac.org.uk

Voluntary Action Kirklees

www.voluntaryworks.org.uk

Bradford Community and Voluntary Service

www.bradfordcvs.org.uk

Keighley Voluntary Services

www.keighleyvs.org

Voluntary Action Oldham

www.vaoldham.org.uk

Voluntary Action Rochdale

www.cvsr.org.uk

Co-ops UK

<http://www.cooperatives-uk.coop/live/cme0.htm>

Charity Commission

www.charity-commission.gov.uk

9. OTHER DEVELOPMENT OPTIONS

There are several options for getting involved in the installation and this can lead to significant savings. For instance, it may be possible for the owner of the land, with other volunteers, to carry out some of the construction work, power house building and laying of electrical cabling. It is important that the installer retains control and management of the scheme to ensure a successful installation.

It is possible to build a system yourself, with sufficient technical knowledge. Systems that people have built range from ones that use old gear boxes - ones that are based around water wheels to highly engineered ones such as the South Somerset one.

Examples of people who have done this, at various levels, include:

[Beck Mickle Micro Hydro Generator](#) - Ian Gilmartin and Bob Cattley prototyped a small head gravity waterwheel design made from reused yoghurt pots.

[Video of homemade turbine](#)

[Judy Woods' DIY installation](#)

[Excellent resources at Build it Solar](#) - The Renewable Energy site for Do-It-Yourselfers

[Build it yourself generator](#)

[Water power from your tap](#)

Water wheels

Although the concept of water wheels is very old, they can prove to be cost effective, especially for low head sites.

The development of waterwheels has been pioneered by Paul and Ingrid Pedley of Pedley Wheels. They installed their first prototype in Sri Lanka in 1998, producing about 1 Kw of electricity. This wheel now supplies 25 houses with electricity – powering fridges, sewing machines and

They have also installed wheels at Pow Gill in Cumbria and Stormaway in the Hebrides and soon to be installed a 4 Kw wheel at Holywell in North Wales, a 2.5 Kw wheel at Ludlow in Shropshire and a 5 Kw one in Derbyshire, providing power for two houses.

Their wheels have an installed cost of about £4000 per kilowatt in this country. For more details see www.pedleywheel.org.uk

Other useful sites include:

[Water Wheel Power Generation](#) – a DIY Hydro electric power project that claims a continuous 50w of 12 volt power from a stream.

[Undershot Water Wheel Generator](#) - Allan discusses how he made a small undershot water wheel generator which supplements solar to charge a battery bank.

[Floating Waterwheel Barricade](#) - How a floating waterwheel barricade can retrieve energy from flowing water in an open river or stream.

[Build It Yourself Overshot Waterwheel](#)

[Joe's water wheel](#) – a simple water wheel to produce 500 watt hours a day

[Build you own water wheel micro hydro from RE UK](#)

Water Wheel Pumps

As well as producing electricity, water power can also be used to pump water.

See below for further info:

[Spiral Water Wheel Pump](#) - John Hermans describes his home made 'positive displacement pump' made using a spiral water wheel to pump water uphill.

[Spiral tube waterwheel pumps](#) - Peter Morgan describes the design and installation of prototype and production of simple but very effective spiral waterwheel pumps.

[Home Made Hydraulic Ram Pump](#) - All the information, diagrams, plans and videos for those wanting to build their own hydraulic ram pump

[Build Your Own Water Wheel for pumping water](#)

10. CASE STUDIES

[The South Somerset Hydropower Group](#) (SSHG) is a group of 10 owners of former watermills in the South Somerset area of England who are installing micro-hydro turbines for electricity generation. The Group was founded as a result of an initiative by South Somerset District Council, and was the first of its kind in the UK. The Group won one of the 2005 Ashden Awards, and the concept has been adopted by a number of other similar groups.

The South Somerset Hydropower Project was begun in 2001 and the first turbine, at Gants Mill (Pitcombe), was commissioned in 2003. When all the mills are in operation it is expected that they will collectively generate around 600 MWh per year, sufficient to supply about 150 homes and avoid the production of 260 tonnes of carbon dioxide emissions.

[The Tintern Angiddy Project](#) - a micro hydro electric project in the Angiddy valley near Tintern, Monmouthshire, UK. Up to 200 litres water per second flows down a 1 Km pipe with a vertical drop of 27 metres driving a small turbine generator which feeds the National Grid. Annual profits realised by the scheme will be distributed within the local Tintern community.

[The Mendip Power Group](#) is a group of owners installing micro-hydroelectric turbines in a number of historic former watermills in the Mendip area of Somerset, England. The group is one of several formed after the concept was developed by the South Somerset Hydropower Group.

The first to start electricity generation was Tellisford Mill, on the River Frome, which began operating in April 2007 and which is ultimately expected to produce 75 kW.

[Settle Hydro](#) was established as an 'Industrial and Provident Society for the Benefit of the Community' with the specific purpose of owning the Settle Weir Hydro Electric Scheme. The scheme will generate revenue by selling the electricity produced, any surplus being used to benefit the local community through its twin aims of regenerating the local economy and promoting the environmental sustainability of Settle District. The scheme has raised part of the finance required by selling shares to members of the public.

[Torrs Hydro New Mills Limited](#) was established in 2006 to develop the Torrs hydro electric scheme on the Rover Goyt in Derbyshire. As a community funded energy scheme, the revenue generated from the site helps to regenerate the local community.

[Brecon Beacons hydro](#) where there are presently 10 hydro electric installations within The Green Valleys project, ranging from a couple of kilowatts to 36 kW. The British Hydropower Association represents the interests of all those involved in the UK hydropower industry. It promotes the use and awareness of small hydropower, and lobbies to protect its members' interests. Regular newsletters keep readers updated on the hydropower industry in Britain.

For more information:

British Hydropower Association

www.british-hydro.org

Membership of the Association is open to any organisation or individual with an interest in the use of water power. Members include manufacturers of all kinds of equipment used in the industry, civil, mechanical and electrical consulting engineers, utility companies, academic institutions, developers - large and small, individuals, charities and students - anyone who is interested in and keen to promote the use of hydropower.

Power from the Landscape

Supporting communities in the development of micro hydro electric schemes in the South Pennines, with funding from The European Agricultural Fund for Rural Development: Europe investing in rural areas



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