



Micro hydro



What is it?



Durweston Mill

Hydroelectricity is generated from the energy in falling water and can be more predictable than other forms of renewable energy. Converting the pressure or kinetic energy of water into electricity through a hydropower turbine is a proven technology that has been practiced worldwide for hundreds of years.

Micro-hydro schemes can be defined as plant of less than 100 kilowatts (kW) and tend to be developed as "run-of river". This means that they don't use reservoirs to store water, but rather just take the flow that is available in the river at any given time. The energy contained in a particular stretch of river depends on the vertical height that the water falls (known as the head) and its flow rate. Both low head and high head schemes are possible and require different turbine types. As a rule, schemes with larger heads require smaller turbines.



Durweston Weir, Dorset
(Keith Wheaton-Green)

Typical components of the scheme include an intake which diverts the water from the river, into a pipe (known as a penstock) which transfers the water to the powerhouse accommodating the turbine and generator and an outflow which returns the water to the river. There are various layout options depending on the

site and its particular head and flow rate (see the British Hydropower Association website link in 'more information' below).

Micro-hydro technology is particularly valid for sites with old water mills as this will help reduce infrastructure costs by re-using existing canals (or "leets"). A rough estimate of the flow rate at a site

can be obtained by consulting the National River Flow Archive held by the Centre for Ecology and Hydrology (see 'more information').

Can I produce all my electricity with this technology?

Yes, if a site has a reasonable head (above 1.5 m) and reliable flow (upwards of 100 litres/sec). In fact the most viable hydro sites are likely to produce much more than a house needs. The flow of the water will vary throughout the year but a 10kW system (for example operating on a 3 m head at 500 l/s) might be able to achieve its full potential for 40-50% of the year. The lower estimate (40%) would enable the production of 35,040 kilowatts hours (kWh) per year, enough electricity for 10 homes.

What does it cost?



Plant room for a 10 kW micro hydro scheme

At suitable sites micro hydro can be the most cost effective of all renewable energy options because plant life is substantially longer than other small-scale technologies

Medium head schemes ranging between 4-20 metres may cost about £4,000-£7,000 per kW installed while low heads below 4 m may cost £5,000-£8,000 per kW installed due to more civil works requirements.

Can I get a grant?

Grants are available for households until April 2011 (subject to availability of funding) from the Low Carbon Buildings Programme (LCBP), at £1000 per kW installed, up to a maximum of £2,500 and subject to an overall 30% limit of the total installed cost.



The installer and the product must be accredited and a condition of the grant is that you must already have installed a basic level of energy efficiency measures including cavity wall and loft insulation, adequate heating controls and low energy light bulbs.

However, domestic grants for renewable electricity systems may not be available once the new Feed-in Tariff is introduced in April 2010, see notes below. Community scale installations (i.e. with local joint ownership or community benefits) can receive 50% funding from the Low Carbon Buildings Programme Phase 2 or 50% funding from the Community Sustainable Energy Programme. They can also apply to utility companies with green energy funds. Sometimes several of the above funding sources can be combined.

What is the economic payback?

Any domestic micro hydro installation commissioned after 17th July 2009 will be eligible for a "Feed-in Tariff" starting from April 2010, even if the installation has received a LCBP grant of up to £2,500. An installation of less than 10kW will receive a fixed price of 17 pence per kWh for all electricity generated for a period of 20 years, even if all power is used on-site. In addition, the householder will receive a further payment of 5 pence per kWh for exported electricity.

Ignoring any grant support, an 8kW micro hydro installation generating power for 50% of the year, assuming 90% the power is exported to the grid and 10% used on site, would generate an annual income from the Feed-in Tariff of £7,500. In addition there would be a saving of approximately £500 per year from the value of electricity used on site, assuming grid electricity costs 14p/ kWh. Total gross financial benefit with the above assumptions would be £8,000 per year, or a simple payback of 7.5 years on a £60,000 investment.

Note the above information on Feed-in Tariffs was verified with the Department of Energy and Climate Change (DECC) at the time of printing this information sheet, but should be checked before making a financial commitment. In the case of micro hydro systems, each installation's payback will be site-specific.

How much maintenance is required?



Plant room of a 500 kW hydro scheme in Cumbria

Once a scheme is established it requires very little maintenance apart from routine inspections of bearings and other moving parts and an annual service. This might cost £400 - £800 per year for a 10 kW system. However, maintenance for

cleaning screens that prevent the ingress of trash can sometimes be time-consuming if automatic cleaners are not installed. After 10 years or so there might be a need to replace seals and bearings and fit a new generator and refurbish sluice gates and screens.

Do I need to get a grid connection?

The new microgeneration Feed-in Tariff provides a better financial return if power is used on-site rather than exporting it to the National Grid. However, because micro-hydro installations are likely to produce more electricity than is required by a domestic residence, any surplus is likely to be exported to the National Grid via an export meter. The property will still be billed for any electricity drawn from the grid.

For larger installations the local grid network may need to be strengthened. The cost can vary between £4 -10,000 depending on the extent of work needed and the distance to the high voltage supply.



Lordsmead Mill, Dorset (Keith Wheaton-Green)



Water wheel at Hewish Farm, Dorset (David White)



Benjafield Mill, Dorset

Are there any planning issues?

Always check with your local authority and the Environment Agency before starting any development. Planning permission will require various consents and licences including an Environmental Statement and an abstraction licence. Issues that must be addressed include any affects on wildlife, noise impacts, visual appearance, any disruption caused during construction, preservation of any archaeological remains and air and water quality.

Special requirements are required by rivers populated by migrating species of fish such as salmon or trout and might dictate the incorporation of a 'fish ladder' so that fish can move up and down the river and avoid the turbine.

What is the potential for this technology in Dorset?

There are many old water mill sites in Dorset and as long as their original weirs and leets (or millstream) remain in good condition there is potential to install modern hydro generation equipment. The rivers Stour, Frome, Piddle, Lym, Wey and Wicken Stream in Corfe are all known to have supported water mills in the past.

It is a good idea to get involved with other local mill owners and join or set up a support group such as the Stour and Vale Hydro Group and the West Dorset Hydropower Group.

The Stour Vale Hydro Group have conducted 13 feasibility studies on ex mill sites and the first five are now at a stage where detailed design work is being carried out and license regulations being dealt with. Similar projects are already well established in South Somerset and Mendip districts in Somerset. The headquarters of the British Hydropower Association is also based in Dorset, in Wimborne.

Micro hydro installers based in the South West

In order to receive a grant or the new Feed-in Tariff householders must use an installer registered with the Microgeneration Certification Scheme (MCS) in addition to an accredited product. Always get several quotes before committing to an installer.

See www.lowcarbonbuildings.org.uk/info/installers/find/installerfind 0800 915 0990

The Dorset Energy Group suggest getting a minimum of 2 quotations and to use local accredited installers whenever possible.



Pros and cons of micro hydro

Pros

- ✓ Schemes generally produce lots of electricity
- ✓ Good paybacks
- ✓ Potential for a high return on investment

Cons

- ✗ Need a fast running or high head water source on your land
- ✗ Expensive
- ✗ Onerous planning issues

More information

British Hydro Power Association

01202 880333

www.british-hydro.org

National River Flow Archive

www.nwl.ac.uk/ih/nrfa/

Environment Agency

08708 506506

www.environment-agency.gov.uk

Local groups

West Dorset Hydropower Group

01308 488 627

e mail: themillhouse@dsl.pipex.com

Local hydro consultant- Keith Wheaton-Green

e mail: Wheaton-Greens@tiscali.co.uk

Stour Vale Hydro Group -
Contact via Pete West at
Dorset County Council

01305 228530

Grants

Low Carbon Buildings Programme

0800 9150990

www.lowcarbonbuildings.org.uk

Community Sustainable Energy Programme

0845 3 671 671

www.communitysustainable.org.uk

0800 915 0990

www.lowcarbonbuildings.org.uk/info/permited/

Renewable energy advice for householders:

SW Energy Saving Trust Advice Centre

0800 512012

www.energysavingtrust.org.uk

Renewable energy advice for businesses in Dorset:

Business Link

0845 600 9966

www.businesslink.gov.uk/southwest

Renewable energy in Dorset and advice for community groups:

Renewable Energy Development
Officer, Dorset County Council

01305 228530

p.west@dorsetcc.gov.uk
www.dorsetforyou.com/climatechange

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