

Discover renewable energy

Using water to make your own electricity

Hydroelectricity

People have been using rivers and streams to generate energy for centuries – making water power one of the oldest forms of renewable energy. But did you know that, in the right kind of location, houses and even communities can run entirely on hydroelectricity: electricity made by flowing water?

More than 2,000 years ago, farmers realised that a wheel turned by water currents could help to irrigate their land. Later, water wheels were used in mills to create power, before the first **water turbines** were developed in the 19th century.

Turbines are smaller and more efficient than wheels – making them a good way to generate electricity.

What's more, by complementing your conventional supply with **hydroelectricity** – or replacing it altogether – you could cut down or completely cut out the harmful carbon dioxide (CO₂) released when you use electricity.



Could hydroelectricity work for your home?

Because of its reliance on a nearby source of water, not everyone will be able to tap into hydroelectricity. So, before looking in detail at the sort of micro hydro system you could use for your home, it's worth making sure your house is suitable. And that means asking yourself the following questions:

- Is your home close to a water source, like a river or stream – or perhaps on an old mill site with a **weir** and **sluice**?
- Is the water source close to a connection to the national electricity grid?
- If you're thinking about replacing conventional electricity with hydro power, are there any big seasonal variations in water flow through your source? If so, do you have a back-up power system?

But don't feel you need to work out all this on your own. For guidance on the above, call your nearest Energy Saving Trust advice centre for free on **0800 512 012**.

Renewable energy is worth your effort

Renewable energy technologies like hydroelectricity systems are a way for you to save money over the long term and help prevent climate change. They can work alongside – and help you use less – energy generated from fossil fuels such as gas, oil and coal. And unlike fossil fuels they produce little or no carbon dioxide (CO₂): the harmful gas that's one of the biggest causes of climate change.



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How does hydroelectricity work?

In simple terms, hydro-power systems use the **kinetic energy** in flowing water to turn a turbine to generate electricity.

Even a small stream can produce enough kinetic energy to turn a turbine. The amount of energy **available** depends on the amount of water flowing per second and the height – or **head** – that it falls from; the amount **produced** depends on how efficiently the system converts water power into electrical power.

And good news: micro hydro systems are efficient enough to turn around half of the energy available into electricity.

Can hydroelectricity meet your energy needs?

To give an example, a small turbine on a hill stream that flows at a rate of 15 litres per second – and from a head of 15 metres – will generate around 1kW of electricity at any given time: more than enough to meet the basic needs of an average home.

In fact, for homes with no mains electricity connection, a good micro hydro system will generate a steady, more reliable electricity supply than other renewable technologies – at a lower cost. The power can be used for lighting and electrical appliances; if it doesn't stretch to heating and hot water, then you may need a conventional gas supply or another form of renewable energy.

For more detailed guidance on all this, why not speak to your nearest Energy Saving Trust advice centre on **0800 512 012**.

The working parts that make up a micro hydro system

- The **intake**, often fitted into a weir, diverts the flow of water from the river or stream into a **forebay tank** and that filters out litter and fish.
- The **penstock pipe** brings water from the forebay tank to the turbine.
- The **powerhouse** is home to the turbine and generator, which are responsible for turning water power into electricity.
- The **tailrace** or **outflow** releases water back to the river or stream.
- **Underground cables** – or **overhead lines** – carry electricity to where it's needed.

How do micro hydro systems affect the environment?

Water turbines can stand out on a landscape and make a certain amount of noise too. While these issues can be solved with relative ease, your most important concern should be the water source you're using to create electricity.

To preserve a river or stream's natural ecological state as much as possible, you should restrict the proportion of water that's diverted through the turbine. In England and Wales the Environment Agency will be able to tell you how to do so, and should be your first port of call for guidance on planning issues. In Northern Ireland you should contact the Environment and Heritage Service. You should also contact the relevant planning authority to ensure that the site and design are acceptable and the appropriate fisheries body and statutory environmental body, such as the Countryside Commission.

Typical weir



Turbine house



Choosing your micro hydro system

Micro hydro systems are categorised as **low head, medium head** and **high head**, depending on the height that the water falls at the site. Low head systems have a drop of 5-20 metres, medium head systems are 20-100 metres, and high head systems are over 100 metres.

Meanwhile, your system can either be connected to the national electricity grid or be a stand-alone **off-grid** source of power.

Off-grid systems can supply electricity for appliances and lighting via special batteries. But if you choose to keep your mains connection as a back-up – and generate more hydroelectricity than you need – you could sell the excess electricity back to your mains supplier.

How much will you save?

Installation costs for micro hydro systems may seem high, but they are often less than the cost of connecting to the national grid. And of course, for an off-grid system, you will have the additional up-front cost of the battery, but there will be **no electricity bills** to follow.

Even if your home remains connected to the grid, you may not need to ever use conventional electricity. And if you make too much hydroelectricity, you can sell this back to your mains supplier. So you'll not only make a **100 percent saving on electricity bills** but also a profit on top.

Plus, with the average UK household releasing six tonnes of CO₂ into the atmosphere every year, you could be cutting your own CO₂ emissions by **up to 1.5 tonnes a year**.

Always ask an expert to help

Choosing and installing the right micro hydro system for your home is a complex process – so always get a specialist to help from the word go. A **micro hydro consultant** will do a site survey and check your home and its location are suitable.

To get the specialist support that you need – and any other advice you're after – speak to your nearest Energy Saving Trust advice centre who can put you in touch with accredited installers. Call freephone 0800 512 012 and we'll be happy to help.

How much will it cost to run your home with hydroelectricity?

The cost of installing a micro hydro system depends very much on your home and the amount of energy you need to produce.

Assuming you're close to a pond or weir, a **low head system** of up to 10kW would cost around £3,000 - £4,000 per kW installed. Systems with outputs higher than 10kW will cost less per kW.

A **medium head system** would come with a fixed cost of around £10,000 plus £2,500 per kW installed. So, for example, to produce 5kW of hydroelectricity at any given time you'd need to spend £20-£25,000 on equipment and installation. Again, costs per kW are lower for systems of more than 10kW.

And if the costs are too high for your household, one option is to club together with your neighbours to install a larger, more cost-effective system that serves your community.





How the Energy Saving Trust can help

The Energy Saving Trust is one of the UK's leading organisations set up to address the damaging effects of climate change. We aim to cut emissions of carbon dioxide (CO₂) – the main greenhouse gas causing climate change – by promoting the sustainable and efficient use of energy. And we want to make it easy for everyone to take action to save energy and help prevent climate change – by offering free, impartial advice.

So, if you're interested in using renewable energy in your home, call your nearest Energy Saving Trust advice centre on **freephone 0800 512 012**.

Our advisors will give you one-to-one advice on what's practical for your home, explain any technical or planning issues and put you in touch with a local, accredited installer. We can even tell you about grants and offers available to help with your planned home energy improvements.

And remember: there are lots of other simple ways to save energy in your everyday life, many of which won't cost you a penny. Again, we're here to help on **0800 512 012**, with more free tips online at **www.energysavingtrust.org.uk**.

Find out even more online

Energy Saving Trust – www.energysavingtrust.org.uk

Renewable Energy Association – www.r-e-a.net

REAL Assurance Scheme – www.realassurance.org.uk/

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

Environment Agency – www.environment-agency.gov.uk



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Energy Saving Trust, 21 Dartmouth Street, London SW1H 9BP, Tel 0800 512 012, www.energysavingtrust.org.uk
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