

By Tim Pullen

Hydro Power – Does it makes sense for smaller projects?



Hydro power is typically associated with big rivers, bigger dams and huge reservoirs, not something the self-builder normally contemplates. But that does not have to be the case. Micro-hydro technology is available that lets the individual home owner (with a stream) generate their own power. Consider, a hydro turbine of just 500W (that is 0.5kW) rating will produce enough electricity through the year to meet the annual consumption of an energy efficient home. You could pick up and carry a turbine that size with one hand.

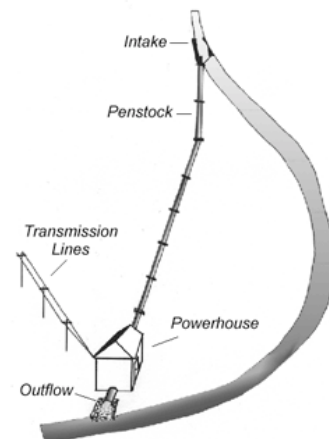
The key question is how big does the stream have to be? And in this the issues are 'head' – the vertical distance between the highest and lowest points of the stream – and 'flow' – the amount of water passing a point, measured in litres per second.

The calculations is : Head x flow rate x gravity x 0.75
(system inefficiencies)

For example, a 5m head with 14 litre per second flow rate will give :

$5\text{m} \times 14\text{l/s} \times 9.81 \times 0.75 = 515$ watts of power.

A 500w turbine may not sound very big, but it runs 24 hours per day, 365 days per year. It will produce around 4,000kWh per year and a reasonably energy efficient house will use about 5,000kWh per year. A 1000W turbine will produce as much as the most profligate user will need.



The water is not all yours



A stream, of any size, is an eco-system to itself and it would be damaging, not to say unlawful, to divert all the water to a hydro turbine. The proportion of water that is safe to use will vary with the type and condition of the stream. In all cases the Environment Agency must be consulted as they will have the say as to what can and cannot be done. Hydro-turbines do not introduce any pollutants, but it may be that your stream supports particularly sensitive fauna and you cannot take much or any water. The EA are keen to see hydro projects go forward and are usually extremely helpful.

Grid connection or battery storage

Although a 1kW turbine will produce almost twice as much electricity as will be used over the year, it will not produce enough at any one time to even boil a kettle. The maximum output is 1kW and a kettle could be 3kW – to say nothing of a 10kW electric cooker. The answer is usually to export to the grid. Use what can be used in the home and export the rest. The new Feed in Tariff scheme makes this the most commercially attractive option.

What will it all cost?

The cost of a hydro-power installation can vary enormously with the particular site. The biggest influence on price is the terrain – the size of the stream, its steepness, the landscape, trees, rocks, depth of soil. To give an order of magnitude, a “typical” 1kW system might cost something in the region of £10,000 to £30,000, but in reality there is no “typical” site. The size of the generator (1kW, 2kW, etc.) will only have a small impact on cost.



The installer will also be an issue and therein lies perhaps the biggest problem. In short, there is a shortage of supply. The bigger companies are not interested in small projects – they can’t charge enough – and the small companies have so much work that some are booking projects 2 years in advance.

The problem is beginning to be addressed with training courses for potential installers springing-up, especially in South Wales. It seems that it is finally being recognised that areas like Wales, Scotland, the Peak and Lake Districts have excellent potential for small, low-cost hydro systems.

Why are we not all doing it?

Most obviously because we don’t all have a stream. Less obviously because most people with a stream think that; a) it is not big enough or b) hydro-power will be too expensive.

Whether the stream is big enough or not can only be established with a site survey. That may cost £300 or £400 but could be a very worthwhile investment.

Is it too expensive? One way of looking at it is that a £20,000 investment in a 1kW turbine installation will fix the price of your electricity at around 8p per kWh for the next 30 years. In addition you will add that value to your property, be immune to energy price fluctuations and save a whopping 103 tonnes of CO₂.