

# Wind&Wave**CONNECT**

CONNECTING THE WIND & WAVE ENERGY INDUSTRIES

WWW.WINDANDWAVECONNECT.CO.UK

ISSUE 1 MARCH 2011 £9.50

Developing  
energy from  
Scotland's  
Pentland  
Firth



Running  
an offshore  
wind farm

Wind&WaveCONNECT  
talks to Robin Rigg's  
Sally Shenton

Offshore wind  
technology

wishes to meet  
innovation

FOR MANAGEMENT & PROCUREMENT

*Cover image courtesy of Atlantis Resources Corporation, Atlantis AK1000 tidal turbine*

A photograph of a stone building with a metal gate over a stone-lined stream. The water is flowing through the gate, creating a small waterfall. The stream is lined with smooth, rounded stones. The background shows a lush green hillside with trees.

# Hydro power

the world's most rapidly  
growing fuel?

by Penny Hitchin

In 2009 hydropower was used to produce 17% of the world's electricity. This was an increase of 1.5% over the previous year, and made hydro the fuel with the highest growth rate worldwide. The big users of hydro include Brazil, Canada, China, Norway and the USA. In 2009 the UK produced a tiny 4.1TW from hydropower, most of it from large scale schemes in Scotland, making up 5% of UK electricity production. Although there is little potential for future large scale hydro (building big dams) in the UK, the introduction of financial support for generating low carbon energy should lead to an increase in hydropower as new smaller scale and micro-hydro projects are developed.

Small-scale hydropower schemes are still in their infancy but the Environment Agency estimates that there are around 4,000 areas in England and Wales where hydro can be used effectively to tap the potential of flowing water to generate power.

Image courtesy of Ellergreen Hydro

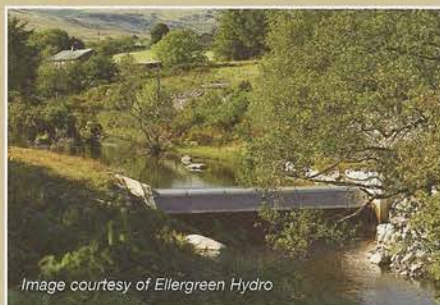


Image courtesy of Ellergreen Hydro

## Developing small-scale hydro schemes in the Lake District

Traditionally water power was used in the hills of the rainy Lake District to power local industries via hundreds of water mills, mostly now abandoned and disused. Logan Gill, the first hydropower scheme of any size to be built on new ground for over a century was completed in summer 2010 and is now exporting power to the electricity grid. The 500kW scheme takes water from a stream on the side of remote Corney Fell in the western Lake District and pipes it 1.1 km down the fell to the River Duddon where a new powerhouse houses a turbine and generator which feeds into the local distribution network. The scheme produces enough electricity to supply 350 local homes.

Logan Gill was developed by Ellergreen Hydro, the brainchild of local businessman Mark Cropper. Three years ago he formed the company in a partnership with hydro turbine manufacturers, Gilkes of Kendal, an independent family business which has been making turbines since 1856.

Ellergreen identified Logan Gill as a possible site for a new high head hydro development as there was a good fall, plenty of water, existing power lines in the valley below had spare capacity and the land owner was supportive. Feasibility studies for the pioneering project were started in autumn 2008, and by March 2009, the company applied for planning consents. The scheme was approved in August 2009 and with the contractors on the site ready to go, building started the next day.

The construction phase took a year and was a steep learning curve for the contractors, developers and planners alike. Installation of the pipe meant working on rocky slopes and

digging through bedrock during bad weather. Controlling the flow of water through the construction site during one of the wettest autumns on record was especially difficult. Needless to say, the scheme didn't entirely progress as planned. Mark Cropper reflects: "Construction was very difficult as the contractor could not work the way we intended so we had to get the consents changed - which was very stressful, but it came out all right in the end."

## Applying traditional techniques to new ground

Mark Cropper is enthusiastic about the potential of hydropower. He has been involved with renewable energy for nearly 10 years, initially in market research for fuel cells, before moving sideways into corporate financing where he specialised in renewables. "When I came across hydro I was immediately captivated," he says. "It is traditional, it works and there is lots of potential for it. The basis of the technology, the turbines haven't changed much, and if they are looked after they will last 100 years or more."

His first hydro project was a 15kW water turbine in the lakeland valley of Longsleddale constructed on a tenanted hill farm which he had inherited. With stock levels kept low to conserve the environment, the farm was not generating sufficient income to fund its preservation. Mark was looking for ways that the farm could generate income and started considering a small-scale hydro scheme three years ago. He got permits in 2008, but the returns did not justify the £85,000 outlay until the award of a grant of £30,000 from the Fells & Dales Leader gave him the confidence to proceed with the project.

The scheme consists of a small concrete intake point on the mountain stream, 200m of buried pipeline falling 30m to the building which houses a refurbished Gilkes turbine, generating equipment and control panel. A weather station and broadband connection enables remote monitoring of the generator's performance and the likely water flow. The Docker Nook scheme has been operational for a year now, and Mark is now developing another micro-hydroelectric scheme in Longsleddale at Kilnstones, a fast flowing mountain stream further up the valley.

The finances for this scheme are underwritten by the existence of the guaranteed Feed-In Tariffs which have enabled him to borrow against these for the construction.

## Could small-scale hydro make hill farms viable?

Mark Cropper is passionate about the contribution that small-scale hydro schemes can make to the economics of hill farms. In the Lake District, hill farmers are the custodians of a much-valued landscape. However, the income from sheep, traditionally the basis of the hill farmers' income, is not enough and farmers must find ways of diversifying. Small-scale hydro could be a source of reliable revenue. Mark says: "The capital expenditure is high but once the scheme is installed, the running costs are very low, it lasts for ever and you can generate meaningful amounts of power. There are easily 100 or more farms in Cumbria which could set up small (sub 50Kw) schemes and the income of a few thousand pounds per year would make a huge difference." He believes that the key to affordability is to keep the professional costs low and for farmers to be prepared to muck in and do much of the work themselves. The existence of Feed-In Tariffs guarantees income and makes it possible to borrow money against the income from the FITs, or against the security of the land or farm buildings.

Ellergreen Hydro is initially focussing on its doorstep in Cumbria where there is plenty of rain and hills. The company is developing expertise in small-scale high head hydro schemes which use small quantities of water falling a long way. For the future Ellergreen Hydro are looking at other schemes in the Lake District and Pennines and offering a bespoke consultancy service to help farmers and landowners diversify hill farm incomes.

"We are still a tiny company but in terms of the Lake District we are leading the way," says Mark Cropper.

## Logan Gill Specifications

Inter Hydro Technology (IHT) designed the civil structures for the scheme and provided project management. The water intake is a broad crested weir with a Coanda screen to reduce maintenance requirements. Water passes into a conveyance channel beneath the screen and continues to an intake chamber at the entrance of the penstock. A fish pass with stainless steel baffles was installed at the side of the intake to facilitate passage of migratory species. The penstock (water pipe) is made up of 600mm diameter, high density polyethylene pipe sections, joined together using an electro-fusing technique. The total penstock is approximately 1km in length and provides a gross elevation head of 100m. The powerhouse was designed to look like a Lakeland barn, in order to fit into the surroundings and meet planning requirements.

The turbine is a Gilkes 450kW twin-jet Turgo turbine. Subject to rainfall, the system will operate for around nine months of the year generating electricity at 415V and stepping it up to 11kV for export to the local distribution network.

The £1.5m scheme was supported by the Cooperative Bank which has a commitment to supporting renewable energy projects and has earmarked £400m for UK small-scale renewable projects.

Ellergreen have a PPA (power purchase agreement) to supply the electricity from Logan Gill to Good Energy.

