



Hydropower

A New Lease of Life

“Alternative Energy for
Landowners and Farmers”
Hereford Racecourse
7 December 2011

David Williams

British Hydropower Association

What is Hydropower?



Dams – bad!

Storage

Water Mills – Good!

Run-of-River



What is Hydropower?

Diversion

Channel



Intake

Pipeline

Power Line

Powerhouse

Tailrace

Hydro Basics

“It all depends on the head”

Head (H)

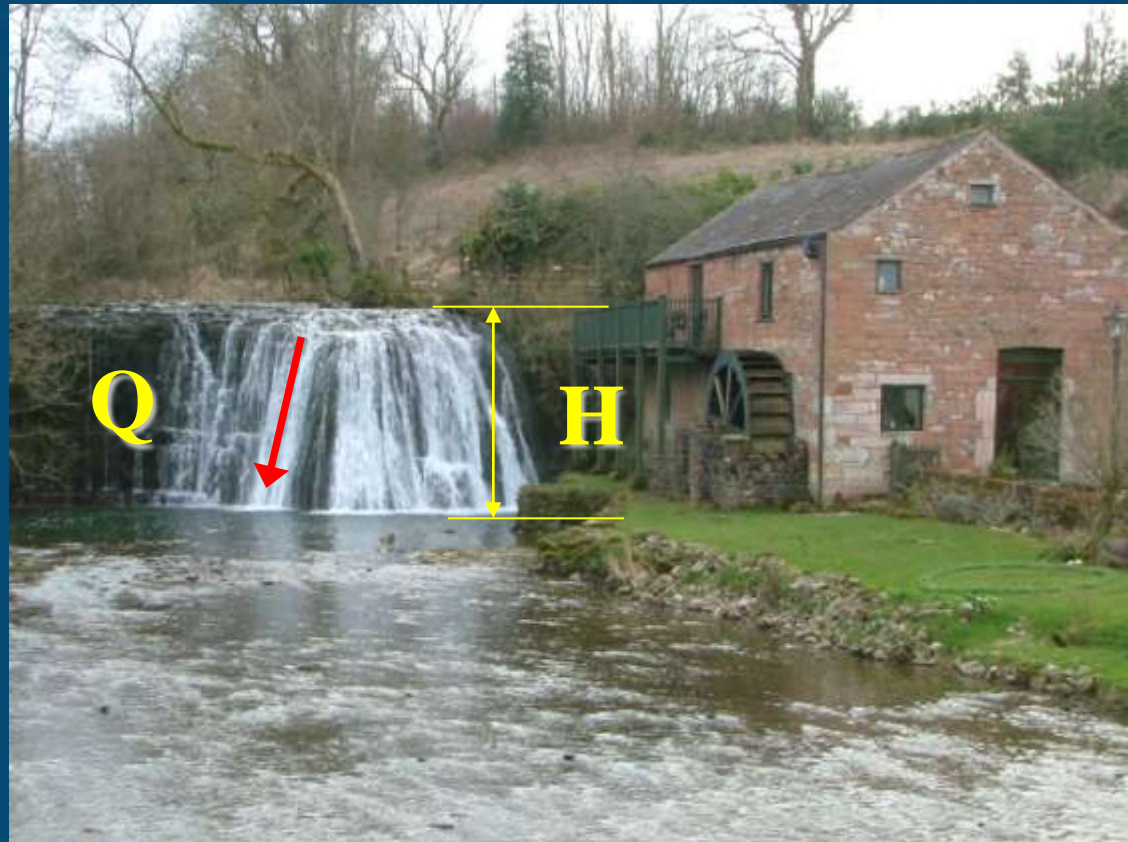


Hydro Basics

.... and Flow Rate

Head (H)

Flow rate (Q)



Hydro Basics

Power

Water power
available = $H \times Q$

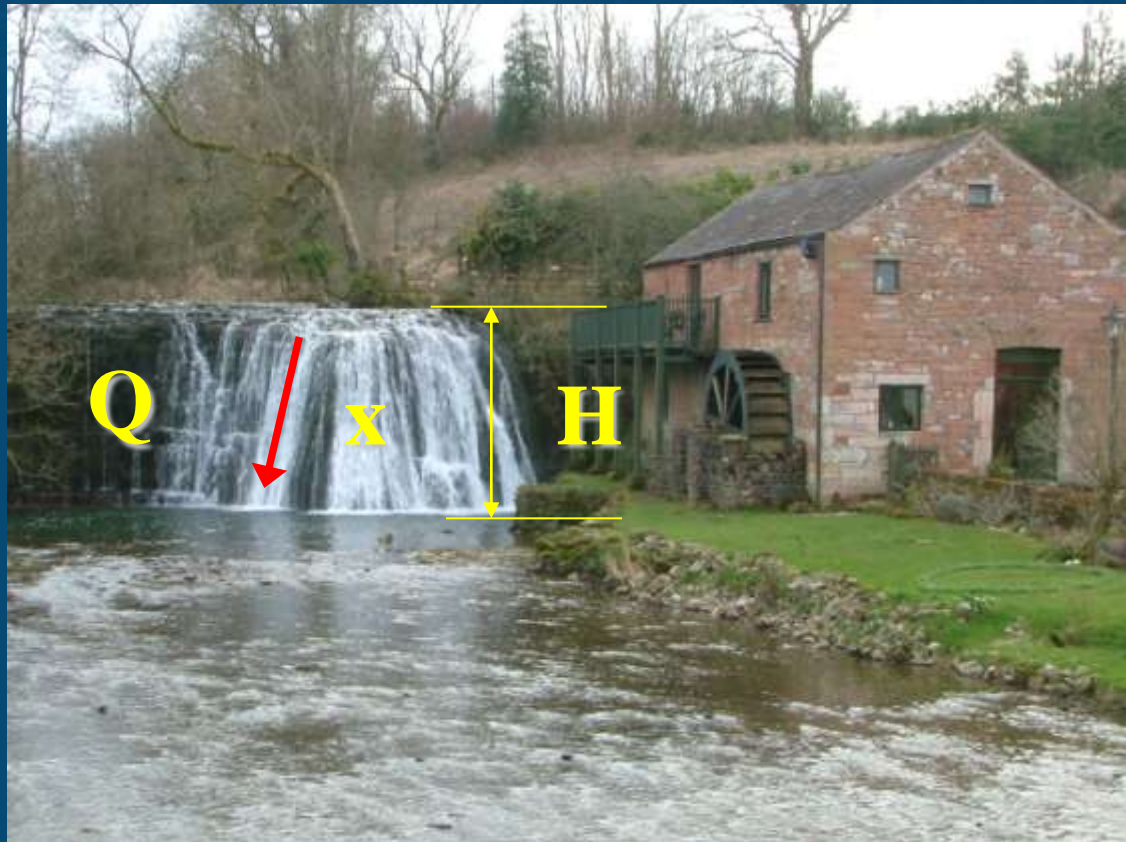
Power output also
depends upon:

Head losses

Turbine Efficiency

Generator Efficiency

Drive losses



Hydro Basics

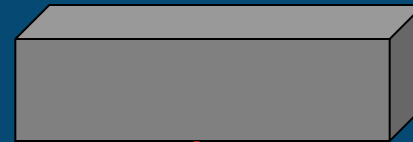
“There’s no such thing as a 80 kW water turbine”

Medium Head = 10m
Flow = 1m³/s P = 80 kW

Low Head = 1m
Flow = 10m³/s P = 80 kW



Small water turbine



Large water turbine

Hydropower in the UK

Present situation

SCOPE

- Pumped Storage
- Storage hydro
- Run of river hydro
- Micro hydro
- Energy recovery from water supply and water treatment
- Refurbishment/replacement and upgrade of old plant

Hydropower in the UK

Policy and Legislation

FOR:

- **Renewables Obligation (and Feed-in Tariffs)**
- **EU Renewable Energy Sources Directive**
- **Regional Development Plans**

Hydropower in the UK

Renewables Obligation

New projects



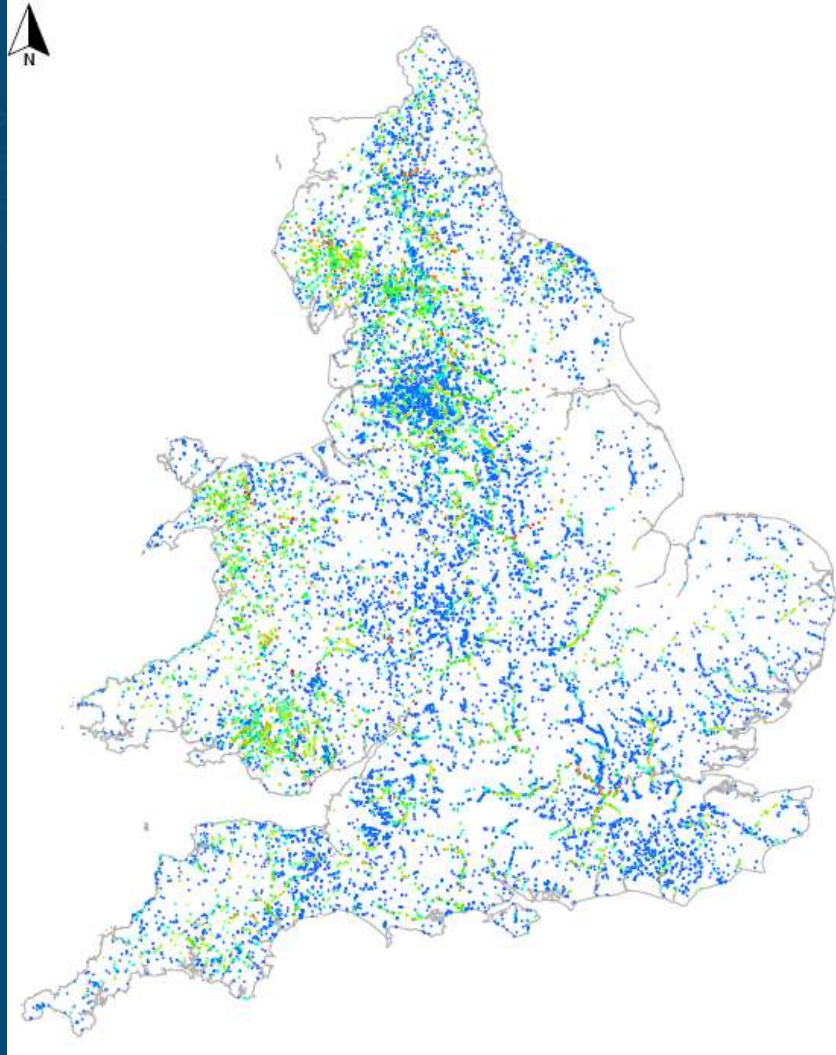
Refurbishment and upgrade of existing projects

Small-scale hydro



Hydropower in the UK

Potential



**EA Hydro mapping
study 2010**

**26,000 barriers
4,000 “win-win”
hydro / fish pass**

~ 600 MW

**DECC / WAG study
250 MW**

Challenges

1. Renewables Incentives

Renewable Obligation

Feed-in Tariff



FiT Review 2011

Possible changes to tariffs - uncertainty

Implementation Apr 2012 - uncertainty

Challenges

2. Environmental Regulation

Available Flow

Fish screening

Fish passes

Eel regulations

Regulatory bottlenecks

Increased numbers of applications

Local views



Challenges

3. The Angling Trust

Emotive

Inaccurate

Destructive

Bridges to be built

Angling Trust
Position Paper: Run of River Hydropower



THE VOICE OF ANGLING



Clockwise from top left: perch sliced in half by hydro blades; hydro turbines on the River Mole in Surrey; salmon leaping over Hexham bridge footings; an artist's impression of Marlow weir with Archimedes screws installed.

November 2011
@Angling Trust

The Water Abstraction and Impoundment (Licensing) Regulations (Northern Ireland) 2006

Guidance for operators of abstractions & impoundments



enhancing
changing.
creating a
inspiring..

Good pract
agency hyd

The environ
hydropower

Published August



Guidance for developers of run-of-river hydropower schemes

Draft for public consultation

3 March 2010



Guidance for applicants on supporting information requirements for hydropower applications

The Water Environment (Controlled Activities) (Scotland) Regulations 2005 (CAR)



THE PROJECT LIFE CYCLE

Five stages

1. Pre-Feasibility
2. Feasibility
3. Planning and Licensing
4. Detailed Design
5. Construction



Timescales & Costs

Stage	Typical Timescale	Approximate Cost
1. Pre-Feasibility	2 months	£500 - £2,000
2. Feasibility	4 months	£3,000 - £10,000
3. Planning & Licensing	6 – 12 months	£200 - £5,000
4. Detailed Design	Included in 5	Included in 5
5. Construction	10 – 12 months	£2,000 - £10,000 per kW

Micro Hydro



Protecting the environment

by promoting the use of hydropower

“Mini Hydro Guide”

The screenshot shows the BHA website's 'A Guide to UK Mini Hydro Development' page. The page has a blue header with the BHA logo and navigation tabs: 'Hydro Basics', 'Finding a Site', 'Costs Involved', 'Contracting', 'Technology', and 'Further Assistance'. The main content area is divided into a left sidebar and a main text area. The sidebar contains sections for 'Welcome!', 'Visit BHA Website:', 'Download:', and 'Contact Us:'. The main text area features a section titled '1.0 Mini-hydro: a step-by-step guide' with an introductory paragraph, a bulleted list of topics covered, and a 'Why mini-hydro?' section with another bulleted list of advantages. A photograph of a small hydroelectric installation is visible on the right side of the page. At the bottom, there is a 'Next >>>' button and a 'Click to View Sitemap' link.

BHA A Guide to UK Mini Hydro Development

Hydro Basics Finding a Site Costs Involved Contracting Technology Further Assistance

Welcome!
Monday, March 24, 2008

Visit BHA Website:

Visit the British Hydropower Association's main website

Click Here to visit BHA ...

Download:

The contents of this website are available for downloading should you wish to print or view offline.

Click Here to Download ...

Contact Us:

If you have any questions or ideas then please let us know.

Contact Us ...

Acknowledgement:

The development of this web-site was co-funded by the British Hydropower Association and the DTI's New and Renewable Energy Programme

1.0 Mini-hydro: a step-by-step guide

This Guide is designed to assist anyone in the UK who is planning to develop a small-scale hydro-electric scheme.

It has been prepared by the British Hydro Association in order to support and encourage new developments in this sector.

The term used in this Guide will be 'Mini-hydro', which can apply to sites ranging from a tiny scheme to electrify a single home, to a few hundred kilowatts for selling into the National Grid.

The Guide will explain:

- The basic concept of generating power from water
- The purpose of different components of a scheme
- The principle steps in developing a project
- The technology involved
- Where to go for help and sources of funding

This guide can also be downloaded as a single PDF file, 955 kilobytes and 31 pages in length.

Each section of the Guide is listed in the menu titles across the page. You can either follow the Guide through from page to page, or pick out the topics of interest from the drop-down menus. Each page can be printed out on A4 by selecting the printer-friendly icon in the corner of each page.

Why mini-hydro ?

Small-scale hydropower is one of the most cost-effective and reliable energy technologies to be considered for providing clean electricity generation.

In particular, the key advantages that small hydro has over wind, wave and solar power are:

- A high efficiency (70 - 90%), by far the best of all energy technologies.
- A high capacity factor (typically >50%), compared with 10% for solar and 30% for wind.
- A high level of predictability, varying with annual rainfall patterns.
- Slow rate of change; the output power varies only gradually from day to day (not from minute to minute).
- It is a long-lasting and robust technology; systems can readily be engineered to last for 50 years or more.

It is also environmentally benign. Small hydro is in most cases 'run-of-river'; in other words any dam or barrage is quite small, usually just a weir, and little or no water is stored. Therefore run-of-river installations do not have the same kinds of adverse effect on the local environment as large-scale hydro.

Next >>>

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www.british-hydro.org

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by promoting the use of hydropower



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