



Will the next decade see a resurgent UK hydropower sector?

Hydropower is a key source for developing the UK's variable renewable energy sources. Hydropower, particularly pumped storage projects has an important role in supporting clean energy development and is recognised as being fully renewable and sustainable.

Glenfield Invicta in Talks Over Optimal Valves and Penstocks for New UK Scheme

Coire Glas, located 20 miles north of Ben Nevis as the crow flies, is a pumped storage hydropower scheme proposed by SSE Renewables. Coire Glas has a proposed capacity of 1,500MW and, when built, will be the first large-scale pumped storage scheme in the UK for more than 30 years; the estimated cost is around £1bn of which 70% will be absorbed by civil engineering works. Glenfield Invicta is in exploratory talks with the consortia bidding for the project over the optimal choice of valves and penstocks. With a design office, manufacturing facility and refurbishment workshop in Kilmarnock, as well as over 100 years' experience on hydropower projects, Glenfield Invicta has unrivalled capabilities in this sector.

To paraphrase Sir Isaac Newton, Coire Glas is standing on the shoulders of giants. The majority of the UK's existing hydropower

schemes are located in Scotland, with 'power from the glens' contributing around **12% of Scotland's electricity requirements**. There are also a number of major hydropower schemes in North Wales including Dinorwig Power Station in Snowdonia which was constructed in an abandoned slate quarry.



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Case Study

Hydropower

Unrivalled Capabilities of Glenfield Invicta Take Centre Stage at Lochaber and Kinlochleven – Case Studies

Although the UK was the location for the first functional hydroelectric project in 1878 (see Q&A at the end of this article), the first commercial projects of note were built in the 1920s and 1930s to power aluminium smelting works. The Liberty Aluminium smelting works based at Fort William, the last in the UK, still draws its power from the Lochaber and Kinlochleven schemes. Glenfield Invicta manufactured the original valves for these schemes. In 2015, Glenfield Invicta supplied exact replacements by creating a 3D CAD model of the valve body using the original valve specification retrieved from its archives. A casting pattern was created from the 3D CAD model and a new valve body was cast in the UK and machined to the original dimensions.

Furthermore, in 2020 Glenfield Invicta supplied, installed and commissioned three replacement stainless steel DN1000 penstocks at Kinlochleven.

Loch Sloy - The Largest 'conventional' Hydroelectric Power Station in the UK

The creation of the North of Scotland Hydroelectric Board in 1943 led to a construction programme that delivered 54 power stations and 78 dams by the end of the 1960s. One of the first projects to be completed was the Loch Sloy hydroelectric scheme. Opened in 1950, and located on the west bank of Loch Lomond, Sloy has an installed capacity of 152MW and remains the largest 'conventional' (i.e. not pumped storage) hydroelectric power station in the UK. After 70 years in operation, Glenfield Invicta recently refurbished one of the needle discharge valves it supplied when the station was first built.

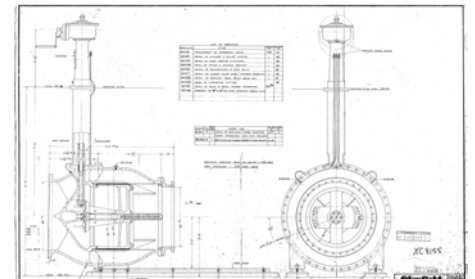
Whilst works on high-profile projects like Kinlochleven, Sloy, Dinorwig and, potentially, Coire Glas grab the headlines, Glenfield Invicta's day-to-day order book is typically filled with supply, refurbishment and installation work on the myriad of smaller hydropower projects across

the United Kingdom. Recent examples include the supply of DN700 and DN900 metal-seated gate valves to the Glenbuck hydro scheme, air valves to Pattack and Glen Lussa, and the refurbishment of a 72" ASC (Automatic Self-Closing) butterfly valve and gate valve at Dolgarrog.



A Unique Archive of Drawings That Help with Specification and Refurbishment Works

Glenfield Invicta has a unique archive of original design drawings from both UK and international hydropower schemes. These drawings are frequently used to assist with the specification of refurbishment works, and replacement valves and penstocks. In some cases, Glenfield Invicta's engineering team reverse engineer replacement products and components when no current valve or penstock option is viable.



General arrangement drawing of valve supplied and installed at Loch Sloy

As can be seen from the examples outlined in this article, hydropower schemes have an excellent track record in terms of longevity; the proposed Coire Glas scheme has a projected operational life of more than half a century. In addition to resilient power generation, pumped storage schemes can provide 'on demand' balancing services to the National Grid and long-duration electricity storage for power generated by other renewables such as onshore and offshore wind and solar arrays. Increasing hydropower would also contribute to the UK's security of energy supply and broaden the renewables technology base.



Refurbishment of Loch Sloy needle valve



Penstock supply and installation



Case Study

Dams, Reservoirs & Hydropower



Will the Tides Turn for Hydropower to Make a Resurgence in the UK?

With such a strong portfolio of benefits, it may well be asked why there have not been more hydropower schemes built in the UK. The answer would appear to be a mix of political, financial and environmental factors. Hydropower schemes are capital-intensive with high upfront costs, rather like nuclear power stations. The volatile energy market means that, without Government commitment, forecasting revenue streams over the longterm is extremely difficult. The UK's energy policy framework has previously failed to provide a context which would encourage the development of long-duration electricity storage (pumped hydropower schemes). With the ideal location for hydropower schemes invariably being in areas of outstanding natural beauty, such as the Scottish Highlands, there are also understandable concerns regarding the environmental impact such projects could have.

The environmental, economic and political tide does, however, appear to be turning in hydropower's favour. The war in Ukraine has highlighted the UK's exposure to the volatility of world energy markets and the need to move away from fossil fuel power generation as quickly as possible; the ability of hydropower pumped storage schemes to act as a store of electricity generated by other renewable sources and thereby to balance out the inevitable fluctuations in, for example, wind and solar generation is very attractive; and, housing hydropower turbines within caverns hewn within mountains minimises the visual impact on the natural environment.

The UK's current installed hydroelectric capacity of 4,713MW accounts for only 0.35% of the world's cumulative capacity.

This explains why much of Glenfield Invicta's hydropower turnover is generated by work on projects outside the UK. However, if Britain is to decarbonise the power sector by 2035 then hydropower cannot be ignored and it looks set to enjoy a resurgence that could rival the peak construction years of the 1950s and 1960s.



Refurbished 72" butterfly valve



Installation of refurbished 72" butterfly valve and new anti-vacuum air valve for Dolgarrog

HOW MUCH DO YOU KNOW ABOUT HYDROPOWER?

For the Global Hydropower Day last year we ran a series of Q&A posts on social media highlighting the fascinating history and the critical future of hydropower, both in the UK and around the world.

YOU CAN DOWNLOAD THE HYDROPOWER SOLUTION BROCHURE ON OUR WEBSITE

The brochure details the broad range of valves and penstocks supplied by Glenfield Invicta into hydropower schemes including free discharge valves, penstocks and sluice gates, reservoir-specification metal-seated gate valves and air valves.

THERE ARE OVER 60 UK HYDROPOWER SCHEMES WITH A CAPACITY OF 1MW OR GREATER.

There is also increasing interest in small scale 'run of river' (ROR) schemes such as Beeston Hydro (capacity 1.66MW) and Coniston Beck (capacity: 292Kw).

THE THREE GORGES DAM

The Three Gorges Dam in China is the world's largest hydropower scheme with a generating capacity of 22,500MW, almost five times larger than the capacity of all the UK's hydropower schemes combined. In 2015, however, an anonymous energy blogger, 'Scottish Scientist' put forward an outline case for the world's largest pumped storage hydropower scheme at Strathearn in the Scottish Highlands. The scheme uses sea water pumped up to a dam constructed in the upper glen of the River Findhorn. It is a fantastic flight of fancy and will never reach a drawing board. On a much smaller scale and with innovation and creativity, however, it does indicate the potential impact hydropower could have.



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