

Hydro Hall of Fame Inductees 2017 Hydrovision, Denver, Colorado

Lake Vyrnwy, Wales, United Kingdom



Due to the growth of the City of Liverpool in the 1880's, the Liverpool Corporation Waterworks Act was passed by the UK Parliament to secure a reliable water supply for the city. Preparations were at once put in hand to gather the work-force and equipment necessary for the construction of what was to become the first large masonry dam in Britain, and the largest artificial reservoir in Europe at the time.

Lake Vyrnwy was also the first dam to be designed to carry water over its crest instead of in a channel at the side. At the bottom of the dam is a body of water known as a Stilling Basin that is necessary to absorb the resultant energy when the water flows over the crest and into the plunge pool below; and to stop the water eroding the foundations of the dam.

Work on the project site began in July 1881 and was completed in 1888.



Dam final construction prior to the lake being filled with water (Note: the village of Llanwddyn which was flooded and whose remnants can be seen in the following short YouTube video - https://www.youtube.com/watch?v=zte6PwmHSRA3203611555_7c063c0b28_b.jpg)

The stone for the dam masonry was obtained from the quarry which was specially opened up in the valley on the eastern side of what is now the lake. As motorized vehicles were not yet commercially viable, all other materials were brought by horse and cart from the nearby railway station at Llanfyllin, ten miles away. Stabling for up to 100 horses was built in Llanfyllin, and at its peak the labour force topped 1,000 men during the busiest stages of the work on the dam. Much of the labour were stone masons working in the quarry, dressing the stone which due to its physical size was not easy to handle.

The building of the dam was not the only engineering feat necessary for the provision of a water supply: equally vital was the creation of a suitable means of conveying the water to Liverpool. The water's 68-mile journey to the distribution system in Liverpool city started at the straining tower on the lake, designed to both strain it through huge wire-gauge filters, and to regulate the level of draw-off.

Into the specially designed tunnel was placed the first of three 42-inch pipes. Along the route to Liverpool of this massive pipe, capable of carrying thirteen million gallons a day, balancing reservoirs and filtration works were also constructed. On the 14th July 1892, the first water successfully flowed into the city of Liverpool.

Over the following years, further studies were undertaken and steps were taken to increase the amount of water that could be drawn off the lake.

In 1904, the first hydroelectric project, utilizing Gilkes turbines, was introduced at the foot of the dam to generate electricity from the dam's compensation flow. The power was initially distributed locally to the village houses, offices, dam works and a local hotel.

The project was successfully replanted with two Gilkes Francis turbines in 1940, with those turbines remaining in commercial operation until 2009.

The project ran in an islanded electrical mode as a mini-grid until 1960 when commercial distribution via the UK's National Grid was connected in area. At this point the project was modified and the generated electricity was exported onto the National Grid, for distribution to other areas of the country as needed.

In 2009, the project was again replanted in the same power house with a larger single Gilkes Francis turbine with higher output capacity, also taking advantage of the UK's Feed-In-Tariff (FIT) incentive program. Upon removal of the 1940's machines, as they were still in a reliable operating condition, they were re-installed without any modification on a small run of river project in Malawi, Africa and are still generating electricity today!

124 years later, Lake Vyrnwy continues to supply Liverpool with fresh water, as well as having been a clean, reliable, and environmentally friendly electricity source for 112 of those years.

The Lake Vyrnwy project, through good custodian care of the water companies is one of Wales hidden gem locations for beauty, nature and conservation.

It is also rumoured to be the water source used in the manufacture and production of Bombay Sapphire gin!



Dam and turbine power house



Water spilling over dam crest



Straining Tower



Latest Gilkes Francis Turbine installation

Gilkes Equipment History at Lake Vyrnwy

Year: 1903

Customer: Liverpool Corp. Lake Vyrnwy, Montgomeryshire, Wales

Gilkes Trent Turbine (x 2)

Output: 22.4kW

Head: 25m

Flow: 370 L/Sec

Speed: 430rpm

Installed and commissioned in 1904 and continued in service until 1940.

Year: 1940

Customer: Liverpool Corp for Lake Vyrnwy Hydro Electric Plant, Montgomeryshire, Wales

Gilkes Francis Turbine (x 2)

Output: 45.2kW

Head: 21.95m

Flow: 260L/Sec

Speed: 1250rpm

Installed and commissioned in 1940 and continued in service until 2009

Year: 2009

Customer: Severn Trent Water PLC

Gilkes Francis Turbine (x 1)

Output: 130kW

Head: 20m

Flow: 750L/Sec

Speed: 750rpm

Installed and commissioned 2009 and in continued operation today

Please also see the following link for further information and history of the project;

https://en.wikipedia.org/wiki/Lake_Vyrnwy