# Letcombe Regis Hydro-Electricity Dam

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**November 2015 (revised September 2021)**

## Domestic electricity generation

The first house to be lit by electricity, Cragside, the home of industrialist William Armstrong was powered by its own generator [1]. A 4kW water turbine driving a Siemens dynamo to power an arc-lamp was installed there in 1879. In 1880 the lamp was replaced by incandescent bulbs and in 1886 a new power house generating 10kW from a Thompson double vortex turbine and a Crompton dynamo was built. Other country houses followed suit, for example in the 1890s Tan y Bwlch generated power using a pelton wheel [2] and in 1903 Batemans, home of Rudyard Kipling, installed the vortex turbine set shown in Fig 1. The 1.6kW dynamo fed a battery bank which was used to power ten 60w light bulbs[3]. Domestic power generation, fuel powered or hydro, continued well into the 20th century, eg Castle Drogo put in a Crompton turbine in the late 1920s[4]. It was only in the 1930s as electrification spread, encouraged by the Assisted Wiring Scheme, that rural houses became increasingly mains connected[5].

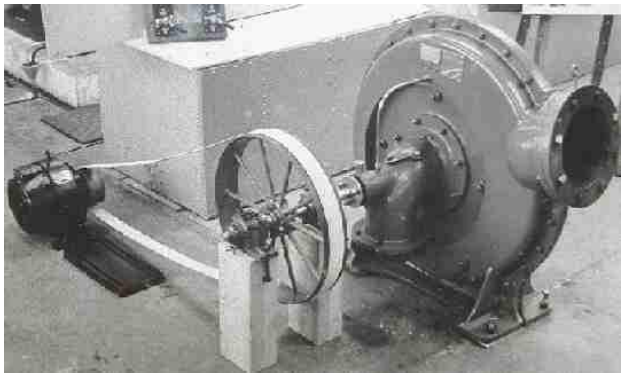

Fig 1. Power plant at Batemans

Thompson vortex turbine (3kW) made by Gilbert & Gilkes driving a Crompton dynamo (1.6kW). Installed 1903 - operated until 1928.

A local example of domestic power generation was at Letcombe Manor in the village of Letcombe Regis which is a mile and a half from Wantage. This involved the construction of a dam and power house which are the only relics of the installation. This article describes these remains and estimates the amount of power which could have been produced.

## Letcombe Manor

Fig 2. Old Berks Hunt meet at Letcombe Manor 1901.

Formerly known as Benham's House the property was sold in 1885 to Stephen William Silver, a retired business man whose companies (located in Silvertown, London) manufactured waterproof materials, insulated cable and other electrical goods[6]. On his death in 1905 followed by that of his widow, Sarah Constance Silver, in 1908 it passed to his son William Stephen Miles Silver, a gentleman-farmer[7]. The house eventually went into commercial use when it was converted to offices and laboratories, first for the Agricultural Research Council and then for the Dow Chemical Company. Because of extensive remodelling it was not considered worth saving when the property was developed as a care-home estate in the 2000s[8]. The dam on the Letcombe Brook is not on the 1898 OS map but is shown on the 1912 edition. Hence the house had electric power installed between those dates, probably when under the ownership of Stephen Silver (himself a supplier of electrical equipment).

**Letcombe dam and power house**

The installation makes use of the fact that between Letcombe Basset and Letcombe Regis the Letcombe Brook, a permanent chalk stream, flows through a steep sided valley with a significant gradient, hence a usable pool of water and sufficient head could be achieved by obstructing the brook conveniently close to the manor, it only required 500m of cable to connect dam to house (Fig 3).

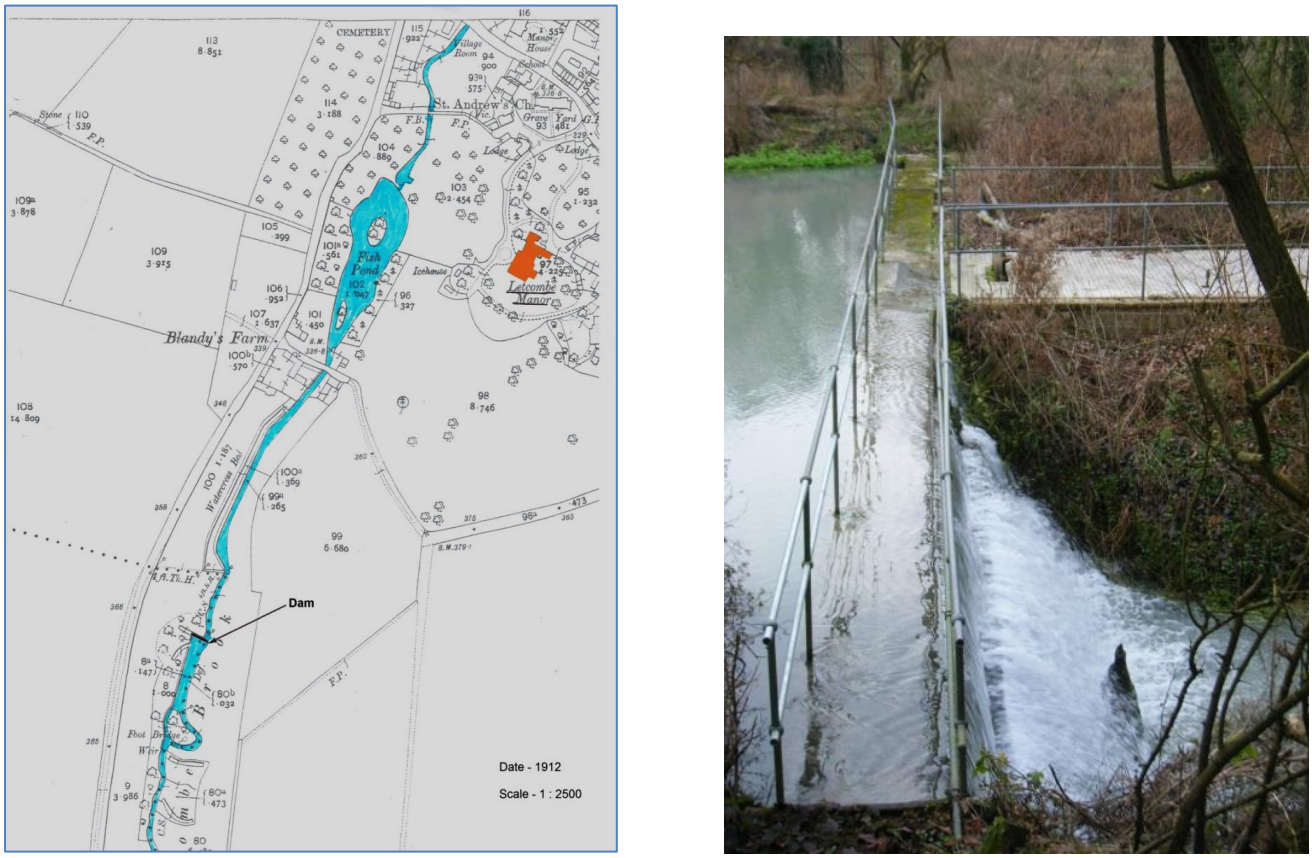


Fig 3. The dam and its location. The brook is in flood (~0.8m$^3$/s) and is overtopping the dam, the dark spike down-stream is the top of the drawdown valve. The power house is the vegetation covered protruding structure.

The dam (Fig 4) is a substantial concrete structure standing about 2.3m above the original stream bed. It is 0.7m thick at the crest, about 1.5m thick at the base and is 22m wide. Attached to the centre of the downstream side is a 6m x 2.3m building of the same height as the dam. The top of this building, which would have contained the hydro-electric generating machinery, is sealed with modern steel plating. Protruding from the plating are the top of the head valve and the control shaft of the tail valve. The inaccessible interior is flooded to full depth.

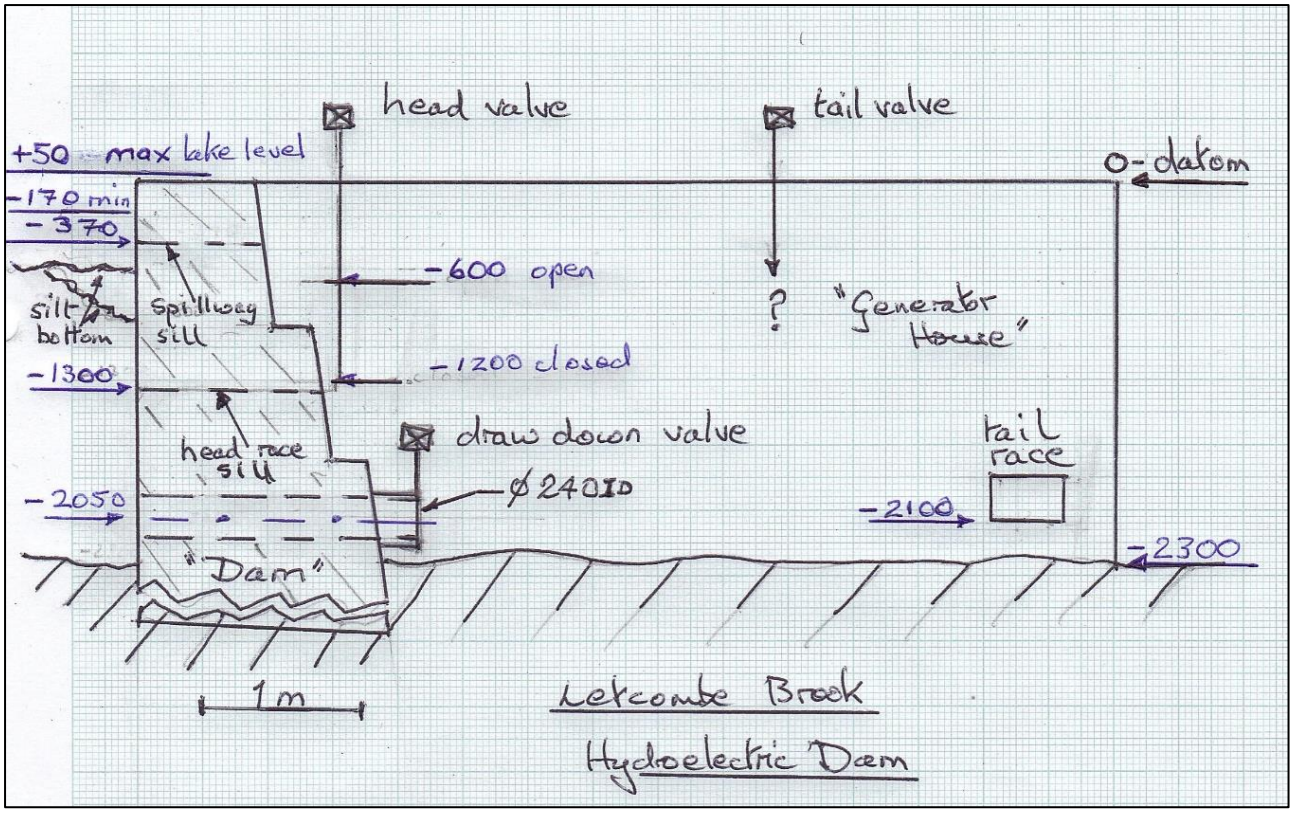


Fig 4. Sketch of the dam and photographs of the head valve frame and the tail race.

On the left side of the dam there is a 1m wide open-channel spillway with its sill 0.37m below the dam crest level. Centrally there is a 1m wide open-channel head race, its sill 1.30m below dam crest, leading to the head valve within the power house. This valve is a 0.70m wide gate valve with its sill 1.20m below crest and a 0.60m opening stroke. The tail valve, except for its control rod, is out of sight and the tail race exits at the base of the building through a 0.5m x 0.3m hole with its sill 2.10m below crest. Close to the dam base is a drawdown valve of approximately 240mm ID situated 2.05m below crest. The lake above the dam is approximately 20m x 70m and un-silted would hold about 3000m$^3$ of water.

**Generating potential**

With the power house both sealed and flooded it is not known if any machinery is still inside. Limited sounding has not detected anything so it is probable that it was removed when it was no longer needed. No records have been found which give any information on the manor's generating plant, although as the manor's owner was director of a company making electrical equipment it could well have been his own products (Fig 5). Despite this lack of evidence, some estimates of the installation's generating capacity can be made.

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Fig 5. 1895 catalogue for the company of which Stephen Silver was a director.

Products include dynamo machines and services include house lighting contracting.

The Letcombe Brook is spring fed with its head 1km upstream of the dam and about 3m higher than the dam lake surface. Its flow rate at the dam is between 0.9m$^3$/s (flood conditions) and 0.1m$^3$/s (dry summer) with a median flow in 2013 and 2014 (years of abundant ground water) of 0.24m$^3$/s[9]. The usable water stored in the lake was about 1500m$^3$ which even at only 0.1m$^3$/s usage would be drawn down in about 4 hours. The dam was there primarily to provide a head pressure rather than storage.

The dam dimensions indicate that the usual operating head would be about 1.5m. Based on this the calculated power outputs at various water flow rates are given in Fig 6. The maximum water flow rate through the power plant would be limited by the dimensions of the fully open gate valve to 0.5m$^3$/s. The water turbine or wheel is assumed to be 70% efficient and the electrical generator is also assumed to be 70% efficient[10].

| Water flow m$^3$/s | Potential power kW | Electricity generated kW |
|---|---|---|
| 0.10 | 1.2 | 0.6 |
| 0.24 | 3.0 | 1.5 |
| 0.50 | 6.0 | 3.0 |

Fig 6. Estimated generating capacity of Letcombe Manor hydro-electric plant.

The calculated values are comparable to the power known to have been generated by the similar sized plant installed at Batemans (Fig 1) at about the same time.

Even at lowest flow ten 60w bulbs could be powered and for half the year the plant might support twice as many 24 hours a day. It was usual for a generator to feed a bank of batteries rather than directly power appliances. This evened out generator fluctuations and by storing power allowed for short term higher power uses, provided the batteries could handle the higher currents. For example, 24 hours of 0.6kW generation would build a charge of 12kWh which discharged over a 6 hour period could power a 2kW appliance.

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**Figures**

All are the author's except for Fig 1 – from solarnavigator.net, Fig 2- The Illustrated Sporting and Dramatic News Jan 5 1901, Fig 3 – National Library of Scotland, Fig 5 – Graces Guide