

# GALLOWAY HYDROS – A CELEBRATED HISTORY

## Overview

The Galloway hydro-electric scheme generates 'green' energy by harnessing the kinetic force of fast moving water. The scheme has a catchment area of 400 square miles in Ayrshire and Galloway and consists of six stations, eight dams, plus tunnels, aqueducts and pipelines.

It was designed and built with great care for the environment and has an excellent record of environmental compliance.

The scheme celebrated its 75th anniversary in 2010, so here is a look back at its construction and key moments in its history.



## Royal Assent for a Brave New Future

The Galloway hydro-electric scheme was built in the early 1930s and commissioned in 1935/1936. With its six power stations, eight dams and network of tunnels, aqueducts and pipelines, the scheme covers a large area in Galloway and South Ayrshire.

Before the Galloway Hydros was built, a number of proposals had been put forward to develop hydro electricity in the area, the first in the late 19th Century. All had failed for various reasons, including opposition from mining interests, mill owners and fishery authorities.

The idea was pursued again in 1923 by two local men – Major Wellwood Maxwell and Captain Scott Elliott – who appointed Colonel William McLelland, a native of Dalbeattie and a partner in consulting electrical engineers Mertz and McLelland. Later, Sir Alexander Gibb and Partners, consulting civil engineers, were brought on board and confirmed that the area had the potential to produce hydro-electric power of about 20,000 kilowatts of continuous load.

At the time, however, there was no outlet for that amount of power locally in the rural Stewartry of Kirkcudbright, which was dominated by agricultural land and had only a few small towns. However, plans for the Galloway hydro-electric scheme received a boost when the Electricity (Supply) Act 1926 was passed, which would pave the way for the development of the national electricity network, or grid.

The new grid infrastructure included a 132 kilovolt (kV) power line between Glasgow and Carlisle, which would provide a means of transporting electricity from Galloway to major population centres, making the project economically viable.

Progressing plans for the Galloway hydro-electric scheme required the passing of an Act of Parliament. The promotion of the Galloway Water Power Bill was undertaken by the Power & Traction Finance Company Limited, which had been involved previously in advancing the legislation needed to develop the Lanark hydroelectric scheme.

The Galloway Water Power Bill received Royal Assent on 10th May 1929, the last day of Stanley Baldwin's Labour Government.

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## Construction of the Hydro Scheme

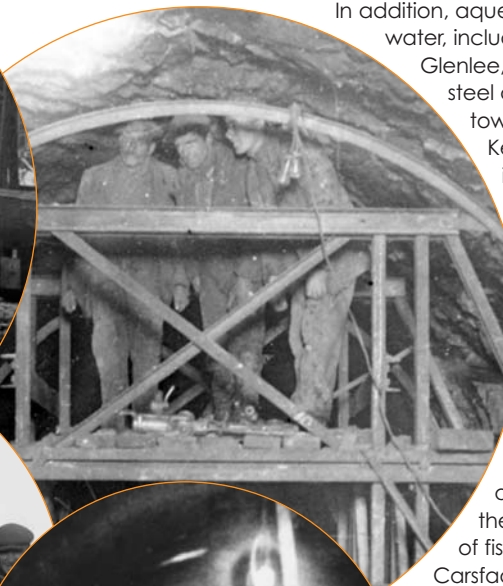
Following the passing of the Galloway Water Power Act, the Galloway Water Power Company was incorporated to develop the scheme. This involved building dams at Loch Doon, Water of Deugh, Water of Ken, Blackwater Burn, Carsfad, Earlstoun, Clatteringshaws and Tongland to supply and store water, along with a barrage at Glenlochiar to control water levels on Loch Ken.

In addition, aqueducts were constructed to carry water, including concrete-lined tunnels at Glenlee, Doon and Deugh and various steel and concrete pipelines. Surge towers were built at Tongland and Kendoon to protect the aqueducts if the stations needed to be shut down suddenly.

The Galloway hydro-electric scheme was originally built with five power stations – Kendoon, Carsfad, Earlstoun, Glenlee and Tongland. Drumjohn, a mini power station at the head of the scheme, was built and commissioned in the mid 1980s.

As the River Dee and River Doon are Salmon rivers, development of the scheme involved the construction of fish passes at Tongland, Earlstoun, Carsfad and Loch Doon dams, to enable salmon returning from the sea to make their way upstream to their spawning grounds.

Electricity substations were built at Tongland, Glenlee and Kendoon, to step up the electricity output from the power stations to 132,000 volts.



*Clockwise from top: building Clatteringshaws Dam in 1933, Labourers lining Glenlee Tunnel, 1933, Workers in Glenlee Tunnel, 1933 Earlstoun workers*

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## Key Construction Challenges

Two elements of the Galloway Hydros project presented particular challenges – construction of Glenlee Tunnel and moving the historic Loch Doon Castle.

### Glenlee Tunnel

The Glenlee tunnel, which connects the intake at Clatteringshaws Reservoir with Glenlee Power Station, was the most expensive and difficult civil engineering project during the works.

Gangs of workmen excavated the 5.8km long, 3.5m in diameter tunnel out of solid rock, mainly blasting out the route with gelignite. The excavation was tackled simultaneously from six faces. Battery-driven locomotives were used to remove the spoil, however the hardness of the rock meant that the tunnel was virtually self-supporting.

Working in difficult conditions, with air having to be pumped through for the workmen, the labourers completed the tunnel at an average of 33 metres per week – or 45m on the best week.

In 1932, a visiting reporter from the Galloway News praised this 'feat of engineering science which had overcome nature'.

The excavation took around 18 months to complete. Workers then had to line the tunnel with concrete using a collapsible gantry. Other major concrete-lined tunnels were constructed to connect the Bow Burn with Loch Doon (1.9 km) and the 2.1km long Deugh Tunnel.

### Loch Doon Castle

Loch Doon Castle, built in the 13th Century by the Bruce Earls of Carrick, stood originally on an island in Loch Doon.

Now maintained by Historic Scotland, the Norman courtyard castle has an eleven-sided curtain-wall, which was built according to the shape of the island.

The castle has a chequered history and is said to have sheltered Robert the Bruce. Bruce's Stone, which commemorates a Scottish battle victory against the English in 1307, is situated near Clatteringshaws Loch. The castle was seized and recaptured several times, set on fire, restored, re-occupied and eventually abandoned in the 17th Century.

Following plans to raise the level of Loch Doon during the construction of the Galloway hydro-electric scheme, the castle was moved, stone by stone and re-built on a site on the mainland.

*Clockwise from top: Tongland flow pipes, spiral casings for Tongland's turbines being manufactured by the English Electric Company in Rugby, Tongland Dam and flood gates,*

## Price that was Paid for Hydro Electricity

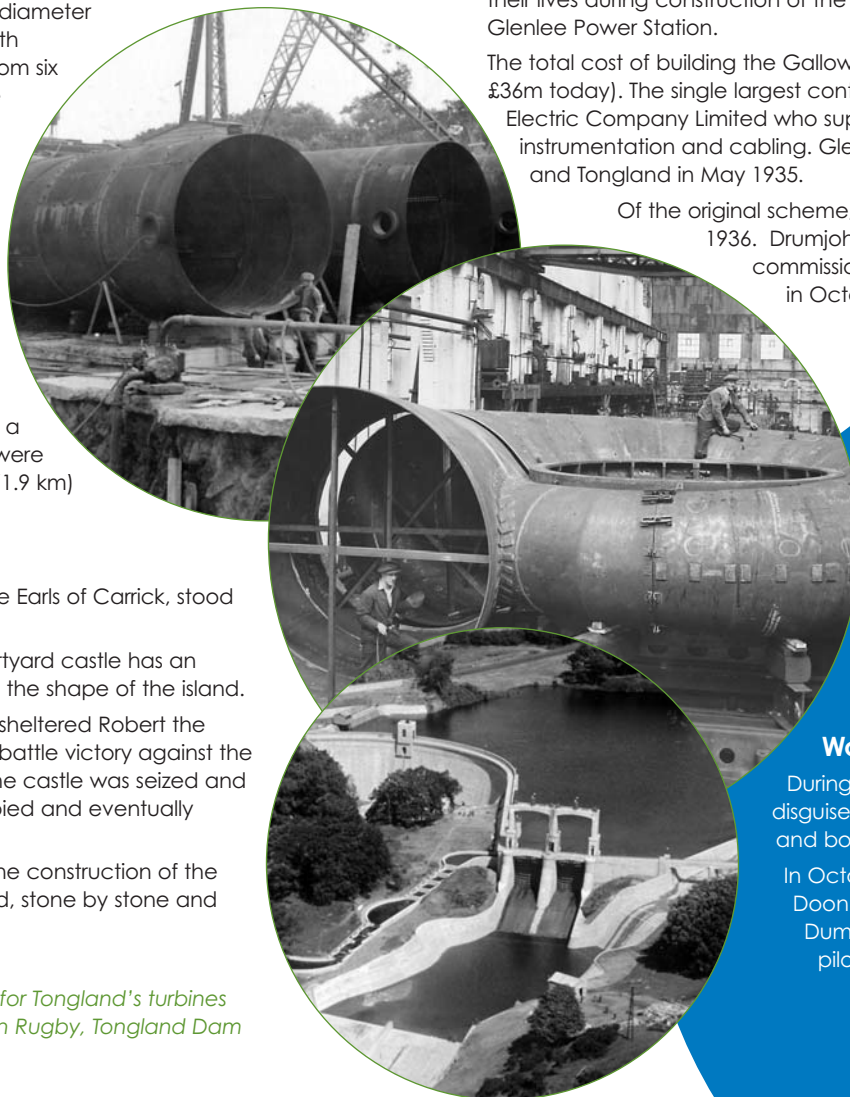
At the peak of construction, 1,500 workers were employed building the Hydros.

The project was built during an economic depression and men travelled from all parts of Scotland to secure employment in Galloway, where they lived in construction camps under harsh conditions.

The work was dirty and often dangerous – health and safety precautions were very basic compared with the present day. Men worked without protection such as hard hats, for example. Several men lost their lives during construction of the scheme. A memorial stone to their memory is located near Glenlee Power Station.

The total cost of building the Galloway hydro-electric scheme was about £3million (equivalent to £36m today). The single largest contract was nearly £600,000 (equivalent to £7.2m today) to the English Electric Company Limited who supplied most of the generating plant, switchgear, control instrumentation and cabling. Glenlee Power Station went into commercial operation in March 1935 and Tongland in May 1935.

Of the original scheme, the last station to generate to the grid was Carsfad, In October 1936. Drumjohn power station in the north of the scheme was later commissioned in 1985. The last station to generate for the grid was Carsfad, in October 1936.



## Doon Treasures

Nine ancient oak 'log boat' canoes, a war club and battleaxe were found in Loch Doon between 1823 and 1831. They have been dated using radio carbon to round 500 AD.

In 1966, angler Jim Buchanan found 1888 silver pennies, which had remained hidden in the loch for 650 years. They bore the names of the English kings Edward I and II, and Scottish kings Robert the Bruce and Alexander II.

## World War 2

During World War 2 the power stations – normally painted cream – were disguised in camouflage colours in a bid to prevent them being spotted and bombed by enemy aircraft.

In October 1941 a Spitfire from 312 Czech Squadron crashed in Loch Doon while on a flight from RAF Ayr. The plane was recovered by Dumfries Sub Aqua Club in 1982 but they did not find the body of pilot Frantisek Hekl.