

Overview

With flooding events becoming more common place across the whole of the UK, local stakeholders often turn to us for explanations about what impact the Hydros Scheme has during flooding events. This leaflet sets out to offer this explanation and also describes the regulations and rules under which ScottishPower operates the Galloway Scheme and the extent of its influence on flood management. The Galloway Hydros was the first large scale integrated hydro electric complex to be built in Britain for the purpose of public electricity supply. The scheme was built by the Galloway Water Power Company in 1935/36. It consists of six stations with an installed capacity of 109 MW, eight dams plus a network of tunnels, aqueducts and pipelines. The scheme is controlled from Glenlee Power Station, near St John's Town of Dalry.



Rainfall & Flooding

Our rainfall records show that average annual rainfall in the area has increased by around 29% since records began in 1937. Average recorded annual rainfall for the catchment area was 1,753mm over the last 30 years compared with a Scottish average of 1,521mm. However rainfall in the northerly catchment areas that feed Loch Doon and Clatteringshaws Reservoir can reach over 2,000mm annually, while the southern areas of Loch Ken and Tongland received around half at 1,200mm. We have also seen flooding events becoming a more common occurrence. Indeed the two largest floods seen in the scheme's history occurred on 30 December 2013 and on the same date in 2015. These were approx. 1/100 and 1/150 year events respectively

Legislative Requirements

ScottishPower is licensed to use water for

power generation under the Water Environment (Controlled Activities) Scotland Regulations 2011.

It is a condition of our licence that the operation of the reservoirs that form the Galloway Hydros shall not exacerbate flooding that would occur under natural conditions.

For example at Clatteringshaws and Loch Doon reservoirs, this means that we restrict power generation off during the peak of any flooding event. However, when rainfall is heavy and sustained these reservoirs can rise to levels where they begin to spill.

ScottishPower must also operate its reservoirs and dams responsibly and in the interests of public safety. Other relevant legislation includes the Reservoir (Scotland) Act 2011 and the Flood Risk Management Act 2009.

How the Scheme Helps to Reduce the Impact of Flooding

The construction of the Galloway Hydros has served to reduce and mitigate the impact of flooding in the area. The large storage capacity of its two main reservoirs, Loch Doon and Clatteringshaws, allows water to be stored in times of heavy rainfall and released when the peak levels pass in a controlled fashion. ScottishPower closely monitors weather forecasts and river levels in the higher, northerly parts of the scheme and can react to the threat of flood by lowering reservoir levels in advance and alerting stakeholders by text message when rivers reach certain levels. Without these reservoirs the flooding impact on towns and land below them would be far greater. The table below details the catchment areas and storage capacity of the Galloway Reservoirs.

Dam/Reservoir	Drawdown Ft.	Catchment Area Square miles	Available Storage Capacity (millions m ³)	Typical Volume for 1 inch rain (millions m ³)
Loch Doon Dam	40	50	83	3.2
Kendoon Dam	8	152	1.1	9.8
Carsfad Dam	4	171	0.9	11.1
Earlstoun Dam	4	194	1.2	12.6
Clatteringshaws Dam	40	47.5	35.4	3.1
Glenlochar Barrage	4	312.5	9.1	20.2
Tongland Dam	10	345	0.85	22

Loch Doon

The spillway siphons on the dam at Loch Doon have only once been brought into

operation in 1950. When the loch rises to 694ft. OD ScottishPower takes a number of actions to reduce flood risk. These include stopping the diversion of water from the Deugh into Loch Doon, abstracting water from Drumjohn Power Station and releasing additional compensation water down the River Doon.

Glenlochar & Loch Ken

The gates on the barrage at Glenlochar on Loch Ken begin lifting automatically when levels in Loch Ken reach 148ft and are completely out of the water by the point it reaches 150ft OD. This allows the unrestricted flow of water out of Loch Ken, returning the loch to conditions that would have existed before the scheme was built. ScottishPower assists to maintain Loch Ken at key levels during the bird nesting season at the request of the RSPB, to avoid flooding out nests of waterfowl and waders.

Other Reservoirs

The reservoirs at Kendoon, Carsfad, Earlstoun and Tongland have very limited storage capacity and can hold only a fraction of what Loch Doon and Clatteringshaws can. The spillways on the dams at Earlstoun and Tongland are shorter than the others so these dams also have floodgates that are used to control the reservoir level within its design limits.

Flood Banks and Pumping Stations

The flood banks that extend from Earlstoun Dam to below Glenlochar Barrage were built around 1850, long before the Hydro Scheme was built. These are owned by private landowners and were not modified or enhanced as part of the Hydro Scheme other than to install three small pumps on embankments below Glenlochar to assist drainage for agricultural land.

The pumping station at Blackpark was also built to provide agricultural land drainage around the Carlingwark Lane. The Lane was constructed in 1765 and drains Carlingwark Loch in Castle Douglas. The canal ceased to be operational for commercial traffic and was abandoned in about 1840. The area around Carlingwark Lane is a SSSI, SPA and RAMSAR site.

For further information please contact us at visit.hydros@scottishpower.com

Does the Hydro Scheme cause or exacerbate flooding?

No. The large reservoirs at Loch Doon and Clatteringshaws both have significant storage capacity to hold back floodwater to protect Ayrshire and Dumfries & Galloway.

Glenlee and Drumjohn do not run during flooding events. Clatteringshaws Dam held back 15 million m³ of flood water on 30 Dec 2015. Water levels in Loch Ken & Castle Douglas could have been significantly higher were it not for this dam.

The small reservoirs at Kendoon, Carsfad, Earlstoun and Loch Ken however have very limited storage capacity and have minimal benefit in the event of a flood.

ScottishPower issue stakeholder text message flood warnings on a voluntary basis and liaise with SEPA and Local Authorities during flooding events.

Does Drumjohn Power Station cause flooding in Carsphairn?

No. Drumjohn stops generating when river levels start to rise. Usually many hours in advance of levels peaking or when flooding occurs in Carsphairn.

A flood study commissioned by ScottishPower and Dumfries & Galloway Council in 2013 concluded that flooding in Carsphairn is not caused or exacerbated by Drumjohn Power Station.

Whilst Loch Doon remains below 694 foot, the water of Deugh is actually diverted to Loch Doon. This reduces the water flow into the Galloway river system.



What are the floodgates used for?

Earlstoun and Tongland Dams have shorter spillways than the other dams and floodgates are opened gradually as the dam level rises to limit the water level over the spillway on the dam to 3ft.



Do Kendoon or Tongland reservoirs back up and flood Carsphairn or Castle Douglas?

No. Kendoon Dam Spillway is at 510ft. OD and Carsphairn Village is at 584ft. OD

Tongland Dam spillway is at 120ft. OD Carlingwark Loch surface elevation is at 143ft. OD

The difference in height between these structures makes flooding of properties above impossible.

Do the Blackpark Pumps protect Castle Douglas from flooding?

The pumping station was built two years after the hydro scheme to address agricultural drainage issues at Carlingwark. The impact of the large reservoirs at Loch Doon and Clatteringshaws meant that whilst the peak river levels were reduced during floods, it also created slightly higher baseline river levels when floods had passed. The pumping station and embankments primary function is to assist drainage of agricultural land however they do provide a degree of protection for smaller flooding events.

A flood study commissioned by ScottishPower and Dumfries & Galloway Council in 2013 concluded:

‘The pumps do provide an agricultural advantage in the local area (as they were originally designed to do) but they provide no significant mitigation to the risk of flooding in the Castle Douglas area during the design 1 in 200 year storm event.

Whilst the Blackpark embankments do work in tandem with the pumps themselves, raising these features does not in itself reduce the risk of flooding at Castle Douglas.

The pumps at Blackpark do not provide any significant flood mitigation to the Castle Douglas area’.

Does dredging Carlingwark Lane have an impact on flooding?

The Dee Marshes around Carlingwark Lane are an internationally important ecological site and registered as a SSSI, SPA and RAMSAR site. Dredging the lane to remove vegetation may help drain the outflow from Carlingwark Loch during low to medium flow/rainfall events.

During high flow/rainfall or serious flooding events, water flows in the opposite direction. In these circumstances removing vegetation could mean the water flowing faster into Carlingwark Lane and potentially exacerbating flooding.

What more are ScottishPower doing to improve flood management?

We continue to work with Local Authorities, SEPA and other stakeholders to explain what impact ScottishPower’s Hydro Scheme has during flooding events and to identify opportunities for improvement.

ScottishPower are making a £2.5M investment at the Galloway Hydros in 2016 including:

- Flow monitoring instrumentation upgrades across the scheme;
- Earlstoun Dam Floodgates upgrades;
- Blackpark Pumping Station upgrades;
- Glenlochar Barrage upgrades;
- Flood studies to allow better predicting and response to floods;
- Flood studies to identify dam & spillway enhancements to deal with large floods.

We continuously review operating procedures to identify further potential improvement opportunities for flood management.



For further information please contact us at visit.hydros@scottishpower.com