2026

Summary of Proof of Evidence

CASE REFERENCE: ENV/3378112

CHRIS ELLIOTT

1. General

My report considers the likely engineering, operational and cost implications of the proposed license changes.

a) Experience and qualifications

I am a Chartered Mechanical Engineer experienced in the mechanical and civil engineering aspects of hydropower developments.

I am a British Hydropower Association member and was a member of the industry panel on the British Hydropower Association/Environment Agency Working Group established to develop the Environment Agency's Hydropower Good Practice Guidelines.

b) Relationship with Objector and involvement with Old Walls Hydro

I am the son-in-law of the Objector and I live nearby to the Old Walls Hydro scheme. I was not involved in the design or construction of the system, and do not have any role in its day-to-day operation.

c) Layout and function of the hydro scheme

See drawing 1022 300 – 302 for the locations of the principal features. The full proof describes how the system currently operates and the observed reserve flow rates.

2. Screening Arrangements

a) Intake screening

Screening "at the head of the leat" on the river frontage is significantly different to the existing arrangements. The principle of screening at this location naturally places all of the mechanical equipment in an area prone to flooding.

Design and installation

The challenges of installing a safe and reliable screen in this location should not be underestimated.

Operation and maintenance

Operation and maintenance will be challenging. There are likely to be events whereby even with careful design the system needs to be shut down during high flows and only restarted after a recommissioning routine.

Operation would need to be wholly automated due to the hazardous position. There would need to be a regular programme of maintenance to the screens, and it would be necessary to anticipate facilities to physically lift and remove the screen units for the maintenance.

Challenges likely to arise in designing, acquiring, installing, operating and maintaining a screen in accordance with proposed condition 9.4

It will be difficult to achieve a safe and maintainable installation, and if one is designed planning permission is likely to be hard to achieve. Construction will be challenging because access is poor and the site is tight and steeply sloping.

The screen will end up being 3.5m wide as a minimum and need to extend up 1m above normal level to cope with flood flow water levels.

Likely costs of designing, acquiring, installing, operating and maintaining the screens.

The EA publishes some cost estimates for various control assets, and these appear to have been referred to in the Cost-Benefit analysis, but these estimates seem to deviate a long way from what is a realistic whole-project value.

Despite the overall project being modest in scale there are a range of unavoidable costs imposed by external factors which mean the project will require substantial professional input and carry costs with large, fixed elements due to regulatory costs, engineering costs and site-specific costs.

A cost of between £420k and £660k should be anticipated.

Comparison of the proposed screen operational costs with existing screen operational costs

Operational costs are likely to be a different order of magnitude to the current arrangement.

I expect the cost to operate and maintain the screens will be £17k per annum.

b) Outfall screening

Work required to design and install a 25mm screen

The 25mm screen suggested could follow the design and positioning of the existing 35mm screen so is in principle possible. There is an associated package of work to lower the outfall bed due to the required outfall flow velocity.

This operation and maintenance would be similar to the current activity.

I do not consider that the conditions proposed would result in an installation which was technically challenging.

This is likely to cost between £28k to £47k to design and install, this is largely for the bed-lowering works.

Assuming there is increased wear and tear, and power output lost as described, the annual cost of this condition might be an additional £1k per annum in total.

3. Measurement and control of abstraction

a) How abstraction at Old Walls Hydro is currently measured and controlled pursuant to the current abstraction licence.

The difference between measurement and control of abstraction

Water level in the weir pool is maintained at a fixed level by the hydropower system, to ensure that the reserve flow notch remains at all times above the minimum required level, ensuring the reserve flow requirement is met. The remaining water flows to the turbine and turbine opening percentage is used as a metric to assess the volume of water used by the turbine. Correlation to opening percentage or power output is an extremely common method to control and measure abstraction by hydropower systems and should be accurate.

Operation of the leat

Old Walls is unusual in that the leat is completely level when there is no flow. For this reason it operates effectively like a pipe; if water is not passed via the turbine, the water level in the leat rises, and inhibits inflow, the weir pool water level rises and the water flows over the weir. Despite being an open leat and not having a sluice continuously moderating the flow, the flow is already automatically measured and adjusted.

Detail of control methodology

The control system continuously monitors the water level at the inlet head sensor. This is positioned in the inlet area downstream of the bridge. The water level here is usually the same as the weir pool, and never higher. This sensor reports either 'low', 'normal' or 'high' water level. This provides a clear indication if the turbine is permitted under the license to increase it's flow or whether it needs to decrease it. 'Normal' water level is a level where the notch in the weir is passing approximately 60l/s. If the water level is showing 'normal' the control system will make no adjustments. If the water level is showing ‘low’ or ‘high’ the control system will open or close the turbine control valve incrementally. This change at the turbine will feed back up the leat, causing the water level to change and regain the ‘normal’ level.

Measurement of abstracted flow is carried out by measuring the percentage opening of the turbine at a set time weekly or daily and using an agreed correlation between opening and flow to calculate a value for abstracted volume.

b) Proposed measurement of water abstracted

Required works for proposed conditions 7.1

The intake control structure as described will form not only a structure with a stage – discharge curve but will also require an upstream active control to moderate flows. The new structure will lower the water level in majority of the leat, which will lead to a higher flow velocity to maintain the volumetric flow rate.

It may be simple to maintain, however there are other ways which are likely to be easier to execute, without reducing power output. Sufficient space for the structure is uncertain.

I believe the total capital costs would be £47k - £85k.

Operational costs of £2k - £3k could be expected, with around £3k of lost generation in addition.

This work will not materially improve efficacy or accuracy of measurement or control in my view, unless it is vital to measure flood water spilling over the spillway.

4. Opinion about the accuracy of the cost-benefit analysis in the statement of case

The cost-benefit analysis does not accurately reflect the real magnitude of the costs. My reading of the EA’s cost-benefit analysis is that a total cost is expected to be £73.9k in year 1, with various other small costs through the life of the scheme.

The cost for riverside 6mm screening is in my view multiple orders of magnitude wrong, unless I misunderstand what is being allowed for. There appears to be an allowance of £12.8k for an automated 6mm intake screen and the river bank.

In my opinion, based on a number of recent schemes this is a highly technical, multi-stage process and I assess it will cost between £420k and £660k to design and implement, and then have an overhead of £17k per annum to operate and maintain.

The costs of the outfall screen and bed deepening have not been included in the EA report, but I believe this will cost £28k to £47k to install, cause an additional £1k per annum maintenance cost, and reduce generation slightly too.

Overall, the capital costs in my view for this bundle of measures will be between £495k and £792k, with annual operational costs of £20k.

There has been no consideration of the cost of the reduced generation leading from the higher reserve flow and imposition of proportional take.

A cursory look at these figures shows that if generation was reduced by around 75%, as is approximately true for this proposal, the scheme income will fall from around £90k per annum to around £22k, and therefore the scheme is highly unlikely to be able to continue to operate at all.