ELLERGREEN | hydro

Tyle Garw Hydro Scheme

Design & Access Statement

March 2023

Hydropower Consultancy & Development

Document Control

Scheme Name: Tyle Garw
Client Name: Adam Cropper

Client Address:

Ellergreen Reference: TG

Ellergreen Group LLP
Ellergreen Estate Office
Hollins Lane
Burneside
Kendal
Cumbria
LA9 5SD

Tel: 01539 726 013
Web: www.ellergreen.com

Document Control			
File Name:	TG-DOC-Design&AccessStatement-A-280323-ARC		
	Revision A		
Prepared by:	A Cropper		
Approved by:	A Cropper		
Date:			
Status:	Approved		
Comments:			

CONTENTS

1. INTRODUCTION

This Design and Access Statement (DAS) outlines the design principles and access issues that have been applied in the selection, scaling and sizing of the proposed hydro power scheme on the watercourse Nant Ystwyth at Tyle Garw, Heol Senni, Brecon.

This DAS has been prepared to accompany the planning application for a micro hydro power scheme. It has also been prepared to accompany the abstraction and impoundment licence applications with Natural Resources Wales.

This statement refers to the objectives of good design as set out in The Town and Country Planning (Development Management Procedure) Order 2012 and explains how they have informed the design process. The particular relevance and weight attached to each of the objectives may depend on local policy, circumstances and the nature of the proposed development.

The objectives are outlined under five headings:

- Context;
- Environmental Sustainability.
- Community;
- Access;
- Movement;

2. CONTEXT

A proposed 34 kW micro hydro scheme for the generation of electricity from a renewable source, water. The applicant is two individuals who co own the project, one individual is a hydro electric engineer and the other applicant is the landowner. The applicants support efforts to address and seek solutions to climate change and is therefore making an effort to contribute towards National and regional requirements for clean energy.

2.1 Location

The Nant Ystwyth watercourse originates at on the North West flank of Ffan Fawr approximately 1.5 kilometres South East of the proposed intake location. Just over half a kilometre downstream of the proposal the watercourse joins the Senni flowing down to the River Usk at Sennybridge to the North.

A Location Plan has been included with the application, and the layout of scheme is shown in the General Layout drawing.

2.2 Works Overview

The works will include:

- A small intake structure across the watercourse on the face of a waterfall, incorporating a Coanda screen with 1mm apertures and stilling chamber.
- A pipeline of HDPE plastic pipe (180mm outside dia.) running from the intake down to the turbine house on the South side of the watercourse. The pipeline is 750m long. The pipeline is within vegetation throughout and will not be buried it will be overground throughout.
- A wood clad turbine house building with a mono-pitched roof, enclosing the hydroelectric turbine, generator, and control panel.
- A 4m 300mm diameter discharge pipe with a screen with 25mm spacing, and an outfall, in the form of a mortared stone cascade, to return water to the beck at the rear of the powerhouse.
- A buried electrical cable from the turbine enclosure to the nearest point of connection.

2.3 Landscaping and Appearance

All visible elements of the scheme will not constitute a dominating factor to the local environment by appropriate sizing and conforming to the local characteristics of the landscape.

The powerhouse will be a timber frame clad in waney-edge boards. In appearance the building will look like a small barn such as are found throughout farms and gardens in the local area.

The intake weir is a very low structure on visable from close by and will be mostly clad in stone and boulders will disguise much of the metal structure.

The pipeline is mostly out of any lines of sight from the intake down to the powerhouse. Vegetation will be encouraged to grow over the pipe and the tree cover that will cover large sections of the pipeline already present will hide the pipeline from view. Full Pipeline burial is being avoided for all of the pipeline to avoid construction impact to the woodland and surrounding area. The method of installation is with forestry winches. In many areas the pipe will be able to be dragged into the vegetation so will be hidden immediately with not further vegetation grow over required.

2.5 General Design Principles

Hydro power is a non-consumptive technology that utilises the potential energy available in flowing water dropping from one point to another. Water is abstracted from a watercourse through a dedicated weir structure with an intake screen, and passed into a pipeline which minimise frictional losses. Water then passes through a control valve, which regulates the

amount of flow, to a turbine that is coupled, either directly or by belt, to a generator. A control system regulates the control valve depending on the water available to abstract, and also connects the generator to the distribution network to export electricity.

2.5.1 Physical Layout & Siting

The locations and pipeline have been checked to ensure minimal interference and disturbance is caused to known environmental resources such as ecology and hydrology. A new intake weir of watercourses can have a small impact to the the hydromorphology of a watercourse (sediment transfer) this has been avoided on this project due to the location of the Intake being position at a nature waterfall in the watercourse, minimising the impoundment of water and not creating an upstream weir pool. This means that sediment passes over the Intake.

No SSSIs, SACs, or Ancient Woodlands are located within the boundaries of the site.

The nature of the site dictates that the construction of the scheme is to be soft and progressive working in good weather with small machinery that does not require significant working corridors or large construction compounds. The pipe installation works are planned to be moved into place using mainly a winches and, a 5-8tonne excavator will be used but only for the construction of the powerhouse foundation.

Over the long term the visual aspect of the construction works and will fade as areas grow over; the powerhouse timber cladding will weather and become more natural looking, grass growth increases over pipeline areas, and the intake construction will weather and be colonised by mosses and so on.

2.5.2 Noise Emission

During the design phase, careful attention has been given to the mitigation of noise. Concerns are often raised during the planning stage of a hydro scheme about potential noise impacts, though in practice, it has been proven that they can be minimised via design. The nearest dwelling is over several hundred metres away and the scheme will be inaudible from there. Nevertheless the ambient noise of the scheme will be limited by the following:

- Proximity of the powerhouse and outfall to running, cascading water
- Small turbine and generator – very little noise generated
- Ventilation vents will be baffled on the inside to control noise emissions
- This scheme is of a similar size and design as other schemes EGH have built, where these measures have been utilised and proven to absorb noise to effectively ensure that there is not an issue of noise emitted from the powerhouse.

2.5.3 Hydrology

The stream is not gauged by the Environment Agency. The LowFlows Enterprise (LFE) model from the Institute of Hydrology was commissioned to develop the flow characteristic of the site, estimating the mean annual flow to be 0.032m³/s, with a catchment area of 0.558 km².

Qmean	Average Flow	32	Litres/sec
Q95	Flow exceeded 95% of the time	3	Litres/sec
Q50	Median Flow – flow exceeded 50% of the time	18	Litres/sec
Q10	Flow exceeded 10% of the time	76	Litres/sec

The hydrological report is enclosed with the consenting applications.

2.5.4 Licensing

A pre-application was submitted to the NRW in February 2018, and feedback has been incorporated into the design of the scheme and into providing appropriate assessments and mitigation.

2.5.5 Abstracted Flow

Hydropower is a non-consumptive abstraction. The turbine will draw a flow not exceeding 0.033m³/sec.

As per the NRW Pre app feedback, the HEP scheme will be based on an abstraction percentage of 70% take above the hands off flow, with 30% remaining within the reach in addition to the hands off flow. This ratio is secured by two open rectangular notches of calculated dimensions. Please see the intake drawing for more details.

2.5.6 Residual Flow and the Deprived Reach

Following EA good practice guidelines, a figure of Q95 has been allocated for the Hands Off Flow which is 3 litres/sec. This will be guaranteed by a V-notch built into the weir, which will be sized to discharge 3 litres/sec before any flow enters the pipeline to the turbine.

It should be also noted that additional flow enters the watercourse from runoff down the derogated reach and provides a variance of flows as well as extra flow on top of the hands off flow provision.

2.5.7 Start-up flow

It is worthwhile to note that before the scheme can start to abstract, there needs to be a quantity of water in the stream significantly greater than the residual flow. This is because:

(a) The turbine only achieves a worthwhile efficiency when it can pass at least 10% of its design flow – 8 litres/sec in this case. It will not pass any flow until at least this flow is available over and above the residual flow.
(b) The turbine control system needs to add an additional margin to be sure that the turbine will not shutdown as soon as it starts up, and then 'hunt' around the start-up condition, switching on and off.

Therefore, in practice, the flow required in the river before the hydro scheme will start drawing any water will be the Residual Flow plus 15% of the Design Flow, i.e. a total of 10 litres/sec, approximately Q68. It is likely this condition will not be met throughout the dry summer months, and other extended dry periods, and at these times the stream will experience its normal low-flow variability with no abstraction taking place.

2.5.8 Flow measurement

Because the turbines have a very flat efficiency curve against flow rate, the total flow passing through the turbine is directly proportional to the units of energy generated, as recorded on the kilowatthour meter in the powerhouse. Hence the annual kWh reading, multiplied by the appropriate factor of proportionality, will provide an accurate figure for the annual flow abstracted. This method is used satisfactorily on other small hydro schemes around the UK and will be used to provide the annual abstraction submission to the Natural Resources Wales.

2.5.9 Output

The installation will produce a maximum electrical output of 34 kW and is projected to provide up to 116 MWh of renewable electricity per year, equivalent to the consumption of 29 average homes, and preventing the emission of 54 tonnes of CO_2 annually.

The energy generated will be exported to the grid, through which the scheme will be providing renewable energy to nearby dwellings. As energy flows to the nearest point of consumption, local residents will be consuming hydro-electricity when it is being generated. This is a relevant point to note as generating at the point of use avoids the high transmission losses experienced by centralised power stations exporting electricity across long networks. It is also planned to reach agreements with the nearby industrial units and paint factory to supply electricity direct to their works.

3. ENVIRONMENTAL SUSTAINABILITY

The purpose of the proposed hydro power scheme is to contribute towards the energy requirements of broader National requirements for sustainable electricity generation.

Via a small construction time period and no long term effect on the local ecology, the scheme will generate the equivalent energy of the demand of 29 average homes, and with regular maintenance and care could operate in excess of 50 years.

As noted above, the annual prevention of the emission 54t of CO_2 is a small but important step in mitigating the effects of climate change.

4. COMMUNITY

4.1 Safety

It has been established that there is no threat to community safety from the operation of the hydro power scheme. All access points to the water flow, and generation equipment, are either screened or locked to protect the members of the community and to protect the scheme from vandalism. Furthermore, the limited moving parts of the scheme, I.e. the turbine and generator, are contained within their own casings and are also locked against entry.

4.2 Social

Renewable energy schemes such as that proposed are often the focal point of social interest. There is can be concern over the general welfare of the community and the schemes effect on it. With appropriate responses from land owner and developer, concerns can be alleviated and the community made more aware of the potential of renewable energy and its benefits for rural areas. The applicant, Coetir Mynyyd, has been actively engaging with the community and nearby landowners in the vicinity of the scheme and their opinions have fed into the overall design of the scheme.

The long term social effect of the scheme, as experienced with previously constructed schemes of this scale, will be that of a positive awareness of renewable energy, particularly hydro, whereby locals will discuss the technology in the wider community, further alleviating concerns in other areas and generally increasing support.

Additionally neither the applicant of landowner live on site and the operation of the project will involve a local being paid for part time work. During construction the project will use local labour, from Senni or wider afield (Brecon) as required.

4.3 Economic

The scheme will provide income (eventually in the long term when the scheme capital is paid off) to the landowner. This income will enable continued stewardship of the land allowing a diversified income from the farm land.

4.4 Flood Risk

The power house is designed with all electronics suitably above ground level and with automatic safety shut down incorporated into the electrical connections. Furthermore, the intake structure will have a very low profile (designed to be submerged). Further information is contained with the project flood risk assessment included with applications.

5. ACCESS

5.1 Proposed Access Arrangements

The access arrangements proposed below take into account the practical need to have suitable vehicular access to undertake the construction of the scheme, with remaining permanent access to the powerhouse.

The powerhouse has good access already present.

A thin working corridor for the pipe route, is sufficient area of access. The forestry winches are carried in by foot and the intake is again carried by human power to the location (flat pack still fabrication able to be taken apart to aid carrying ability). As the pipeline is not buried the working corridor will be very limited with no need for material set aside for soils or excavation along surface pipe areas.

5.2 Rights of Way

There are no public right of way within the construction boundaries of the scheme.