FORM WRD: Application for a new abstraction licence or a technical variation to an abstraction licence

Water Resources Act 1991, Environment Act 1995, The Water Resources (Abstraction and Impoundment) Regulations 2006, The Natural Resources Body for Wales (Functions) Order 2012

Cyfoeth Naturiol Cymru Natural Resources Wales

1. Application type

New full abstraction licence	☒	Give existing licence serial number and/ pre-application reference number
New temporary abstraction licence	☐	
New licence to transfer water	☐	PPN-00152
Renewal of a time-limited abstraction licence	☐	
Technical variation to an abstraction licence	☐	

For hydropower abstractions, specify the capacity (in kilowatts) of your scheme.
25kW or less ☒ >25 to 50kW ☐ >50 to 100kW ☐ >100kW ☐

2. Linked licences

2.1 Does your proposal involve water rights trading?
No ☒ Yes ☐ If yes, provide licence serial number(s)

2.2 Is the licence (to be) aggregated with any other licences?
No ☒ Yes ☐ If yes, provide licence serial number(s)

3. Abstraction details

Provide details of all points of abstraction**.** Details of abstraction location(s) should correspond with any maps submitted.
If necessary, continue on a separate sheet and tick here to show that you have done this ☐

Abstraction location name / reference	Type (single point / reach)	National Grid Reference (12 digit)	If a reach, downstream National Grid Reference (12 digit)
Afon y Foel	Single point	276167 345675	

4. Means of abstraction

Detail the structure and equipment involved in the abstraction process. If this information is detailed in a supporting document, provide the document reference. For groundwater abstractions, include borehole depth and diameter and provide details of screening and lining.
If necessary, continue on a separate sheet and tick here to show that you have done this. ☒

Water will be extracted via a pair of Coanda screens. The flow rate will be limited (a) in dry conditions below Q95 by a flow restrictor on the smaller screen and (b) in wetter conditions because the larger screen has a maximum flow capacity of 14.2 L/s.
See **HyR proposal v13.pdf** and **Weir design details v3a.pdf**.

5. Abstraction quantities

Provide details of the abstraction quantities and periods proposed, including any deregulated abstractions (< 20 cubic metres per day) you currently have. Details of abstraction locations should correspond with any maps submitted.

Abstraction location name / reference	Purpose which water will be used for	Abstraction period (state 'all year' or give months)	Maximum annual abstraction volume (cubic metres)	Maximum daily abstraction volume (cubic metres)	Maximum hourly abstraction volume (cubic metres)	Number of hours of abstraction per day	Peak abstraction rate (litres per second)
Afon y Foel	Hydro-power	All year	293000	1279	53.3	24	14.2
Afon y Foel	Domestic	All year	314	1.48	0.4	24	0.3
See *Justification for the extraction regime v5.pdf* for further details. The maximum annual volume given above is the annual mean of the maximum extractable flow rate (10.1 litres/sec = area under the flow duration curves, subject to the 15 L/s and 0.6 L/s limits) × seconds per year. The probable extraction based on estimated typical electricity usage, when possible, of 1.5 kW (summer), 6 kW (winter) (flow rates 1.82, 6.62 L/s) would be as follows:							
Afon y Foel	Hydro-power	Summer (probable)	(24900)				
Afon y Foel	Hydro-power	Winter (probable)	(96700)				
		Total	293314 (122000)	1280.5	53.7		

6. Calculations and supporting information

Please provide further details of your intended use of water, including calculations in support of the quantities you have requested, your operational regime and any management agreements. See Guidance Note WRX for details of what is required. If your proposal involves the provision of a residual flow via a notch or orifice, provide information on how this has been calculated.
If necessary, continue on a separate sheet and tick here to show that you have done this. ☒

The water will generate electricity and provide the domestic water supply for Hafod y Rhedrwydd.
Please see attached **HyR proposal v13.pdf** for general details and **Justification for the extraction regime v5.pdf** for further information about flow rates and the values used in table 5 above.
The notch calculations are described in **Weir design details v3a.pdf**.

7. Industry-specific requirements

Complete the relevant table in line with the purpose of your proposal to demonstrate a justification of need for the quantities proposed. For uses not covered here or to provide further details, please use a separate sheet and tick here to show that you have done this ☐

7.1 For agricultural use:

Crop type	Soil type (for multiple soil types, indicate approximate split)	Maximum area of crop to be irrigated annually (hectares)	Maximum annual depth of irrigation to be applied (millimetres)

Livestock type	Number of animals	Maximum daily quantity of water used (cubic metres)	Comments
Provide details of any additional requirements (washing / cleaning)			

7.2 For golf course irrigation:

Feature	Maximum area to be irrigated daily (hectares)	Maximum depth of water to be applied daily (millimetres)
Tees		
Greens		
Fairways		
Others		

7.3 For industrial use:

Industry sector or process type	Water use per unit produced (state units)	Maximum units produced per year
e.g. Ice cream	*1.9 cubic metres per tonne of ice cream*	*10,000 tonnes*

7.4 For hydropower:

If you have submitted this information as part of your pre-application enquiry and no changes have been made to your proposal in the meantime, you are not required to provide these details again.

% abstraction and zone applied for (see HGN2)	Average gradient of depleted reach (%)	Catchment size above abstraction point (kilometres square d)	Net head between abstraction and discharge points (metres)
Zone 3. 0.6 litre/second below Q95. 0.6 + 0.62(Q-Q95) above Q95.	20%	0.865	150
Turbine efficiency (%)	**System efficiency (%)**	**Maximum power output (kilowatts)**	**Annual capacity (kilowatt hours)**
83% (max). See HyR proposal v13.pdf for efficiency graphs.	Maximum efficiency 64% at 4.1 litres/sec	9.4	56470 (maximum subject to extraction limits and flow duration curve; estimated actual generation 30575 kWh using probable flows from box 5 above)

State the length of depleted reach (in metres) 791

Provide the flow data (in cubic metres per second) & ratios specified below:	
Q95	0.004 m^3/sec
Q10	0.155 m^3/sec
Qmean	0.058 m^3/sec
What is the ratio of Q95:Qmean?	0.069
What is the ratio of Q10:Qmean?	2.67

Please send us a copy of the full flow duration curve for the site and confirm the method used to derive this. If you have used modelling software such as LowFlows, please provide us with a copy of the output (graph, data and catchment map) including the Long Term Average rainfall.

- See ***LowFlows_530_18 Hafod y Rhedrwydd.pdf*** and ***HyR catchment photos.pdf***. The monthly Q95, 99 and 99.9 predictions are plotted in **Justification for the extraction regime v5.pdf**. The LowFlows simulation assumes an average annual rainfall of 2410 mm.

What low flow protection* do you propose to maintain in the depleted reach when the hydropower scheme is operating (in m^3/s)?

* Low flow protection is the flow rate above which abstraction can begin and is separate to the abstraction % take, see HGN2 for details.

See **Weir design details v3a.pdf**

8. Means of measurement

State how you intend to measure abstracted quantities at each abstraction point.

Meter ☐ Power Generated ☒ Other ☒

If other, please specify: Calibration of spear valve flow rate against spindle position.

9. Water efficiency

Describe all steps you have taken or intend to introduce to ensure efficient use of water, such as water storage, re-use or conservation provision. If necessary, continue on a separate sheet and tick here to show that you have done this. ☐

The domestic water usage will be a very small fraction of the total. Hafod y Rhedrwydd sleeps 5; using the UK average of 150 litres/person/day implies typical usage of 750 litres/day (less than 0.01 litre/sec).
The electricity-generating usage has been minimised by siting the turbine hut as far downhill as possible to give the greatest possible head. The generating equipment will be designed to be as efficient as possible, for instance using high efficiency permanent magnet alternators.

10. Fish and eel considerations (surface water abstractions only)

10.1 Confirm the fish species present at your site. If you are submitting a survey or report with your application, please tick here to show that you have done this. ☐

The extraction point is in a very small stream and situated above two large waterfalls. No fish have been seen there. See ecological survey.

10.2 Does your proposal include measures to safeguard fish and eels? Only provide details of outfall screening if abstracted water is to be discharged back into a watercourse.

	Intake	Outfall
Type of fish screen	Coanda screen	Stainless mesh (to deter nesting birds)
Screen aperture size (mm)	1 mm	10 mm
3-stage fish ladder (jump over barrage, then into plunge basin, then over screens) to make upstream passage much easier than with the existing waterfall. Carpet-lined eel trough to assist eels in climbing out of the stream to bypass the extraction screens.		

11. Discharge details

11.1 If you intend to return any of the abstracted water to the environment, provide details below. Details of discharge location(s) should correspond with any maps submitted.

Discharge location name / reference	National Grid Reference of discharge point (12 digit)	Total volume to be discharged (cubic metres)	Environmental Permit for Water Discharge Activity number (if applicable)
Afon y Foel	276539 346262	293000 m^3 per annum (maximum possible; in practice probably closer to 122000 m^3).	

11.2 Provide a description of the structure and equipment involved in discharge.

See attached file **HyR proposal v13.pdf** pages 5 & 6.

12. Other abstractors / water users

Provide details of nearby abstractors or users of water who could be affected by your proposal. This should include deregulated users (exempt activities or abstractions < 20 cubic metres per day), anglers and canoeists.

None

13. Planning application

Have you sought advice on your planning application?

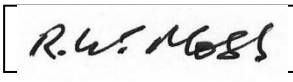
No ☒ Yes ☐

If yes, submit a copy of the Planning Authority's response.

14. Declaration

Please see Guidance Note WRX for details of who can sign this section and note the information in that document relating to the Data Protection Act 1998.

By signing below, you are declaring that as far as you know and believe the information given in this form, on any map and in any supporting or additional information, is true.

Signed	
Print name	R.W.Moss
Position	Cottage owner and engineer.
Date	2nd November 2018

Application Checklist

Please tick the following checklist items to indicate that you have included the required information. If any sections of the form are left blank and no supporting information submitted, where we have insufficient information to make a decision on your application, we will return your application to you.

Essential:

Form WRA completed ☒

Map showing applicant's land boundary with all abstraction and discharge point(s) clearly marked ☒

Evidence of negotiations of expected access rights, if applicable ☒

State number of continuation sheets (enter 0 if none included) 22

Where relevant:

Letter of authorisation from the applicant, allowing the agent to act as signatory ☐

Form WRE completed, if your proposal also requires an impoundment licence ☐

Further information requested in our pre-application response letter to you ☐

For hydropower applications, full flow duration curve for the site, confirmation of the method used to derive this and a copy of the output (graph, data and catchment map) including the Long Term Average rainfall, where available ☒

Planning Authority response, where available ☐

Additional supporting information - please list below:

Attached documents:

- HyR proposal v13.pdf
- Justification for the extraction regime v5.pdf
- Weir design details v3.pdf
- Drawings HyR_181102A.pdf, Hyr_181006C_rev1.pdf and HyR_181006B-1.pdf
- Email from the National Trust March 2017