

Hafod y Rhedwydd micro-hydro: justification for extraction rates beyond Q95						
(required minimal water extraction for a variety of basic loads)						
System losses and parasitic loads	(Watts)					
Turbine windage	64					
Alternator windage and iron losses (MOOG GES013v2)	48					
Bearing losses	17					
Turbine control system	15					
Telemetry (4* FibreFox wire-fibre converters)	20					
House load-limiting system	10					
Isolation transformer for upper cable section	5					
Extraction point & weather station sensors (2*Raspberry Pi, 2*Arduino?)	10					
3G weather station modem (e.g. Teltonika RUT230)	5					
Battery self-discharge rate	7					
Inverter for turbine power (ABB Uno)	24					
Battery inverter (e.g. Victron Multiplus24/3000/70)	13					
	238					
Turbine efficiency	0.75					
Rectifier efficiency	0.99					
Head (m)	150					
Gravity "g" m/s ²	9.81					
Penstock efficiency assumed 100% at low flows						
Desirable loads without running petrol generator:						
<i>if on continuously:</i>	Device power (W)	cumulative total (W)	"water power" (W)	turbine flow rate kg/s	% of 4L/s stream flow	% of 2 L/s stream flow
UV steriliser	20	258	347	0.236	5.9%	11.8%
+ A* fridge	30	288	388	0.264	6.6%	13.2%
+ TV+FreeSat box	44	332	447	0.304	7.6%	15.2%
+ House lighting, 24 * 6W LED bulbs	144	476	641	0.436	10.9%	21.8%
+ Satellite broadband	35	511	688	0.468	11.7%	23.4%
<i>if on for limited periods (using battery bank)</i>						
additional battery charging losses	8					
UV steriliser (24 hour/day)	20	266	358	0.243	6.1%	12.2%
+ A* fridge (24h)	30	296	399	0.271	6.8%	13.5%
+ TV+FreeSat box (4h)	7	303	409	0.278	6.9%	13.9%
+ House lighting, 24 * 6W LED bulbs (3h)	18	321	433	0.294	7.4%	14.7%
+ Satellite broadband (5h)	7	329	443	0.301	7.5%	15.0%