



# Barr River hydro scheme

## Monthly report – December 2022

### 1 Summary

December was relatively dry and a significant issue with the generator breaker led to an extended period of lost generation (approximately 6 ‘productive’ days were lost). The generator breaker problem was diagnosed within 4 working days of occurrence and resolved within 5 working days of diagnosis. This was the first serious test of the reactive maintenance arrangements. Although there were some delays (notably associated with CINK/Alva engagement within diagnosis), and some lessons learned (spares stock to be reviewed), we consider that the plant and team are already much better prepared to respond to similar issues in the future.

### 2 Monthly generation & revenue

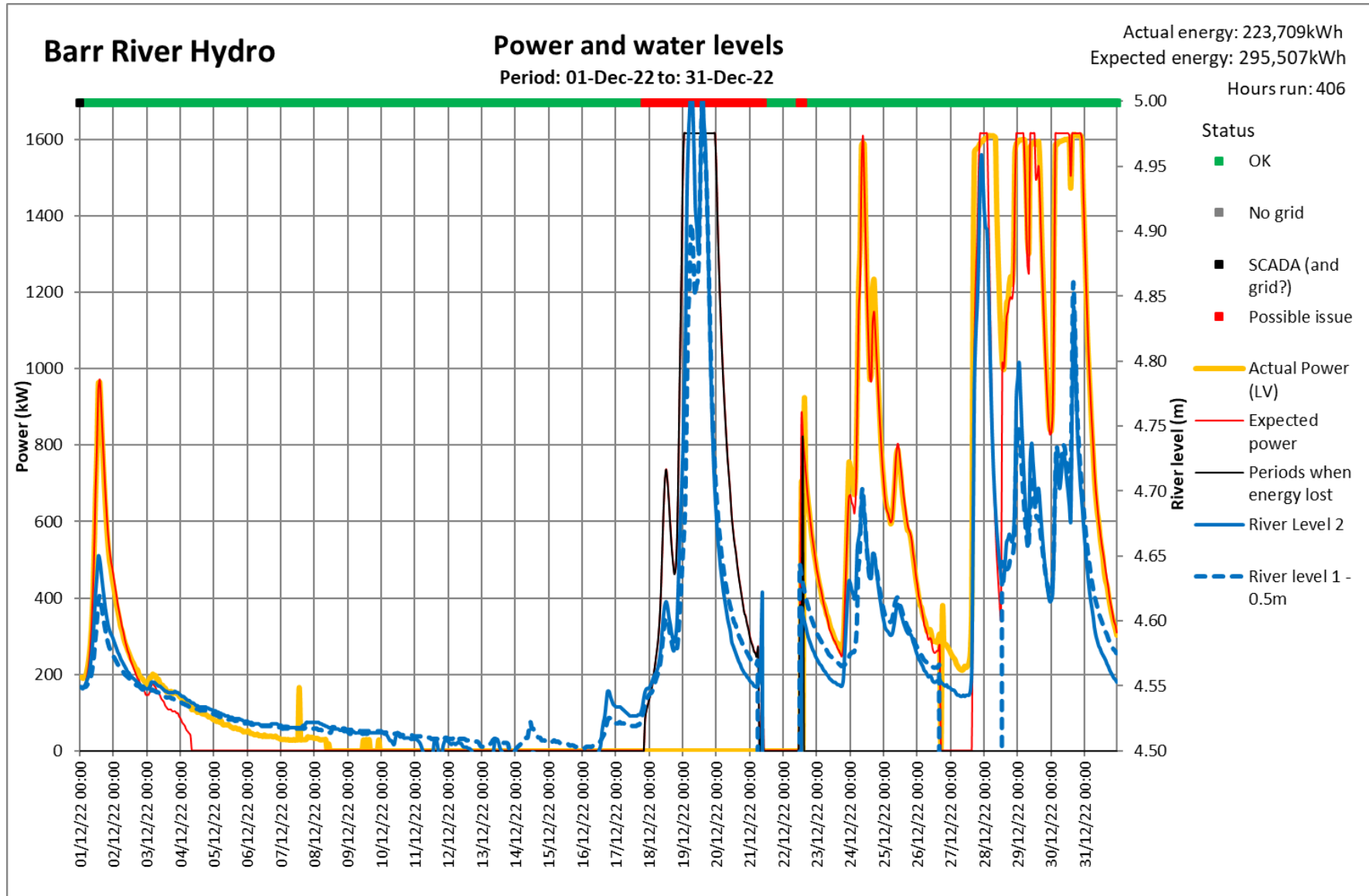
Parameter	Value
Actual generation (FIT meter), kWh	223,709
Average generation in month, kWh	368,179
Forecast generation in month (P50), kWh	620,057
Actual relative to forecast	36.1%
Rainfall relative to 1991-2020 average by month	89%
Calculated generation <sup>1</sup> kWh	295,507
Actual relative to calculated generation, kWh	-71,798
Actual relative to calculated generation, %	-24.3%
Approximate revenue in month <sup>2</sup>	£34,832

<sup>1</sup> Calculated generation is based on river level data and seeks to establish the expected generation with no performance issues. The expected power and energy calculations are being calibrated and will be refined over the coming months as more data is gathered.

<sup>2</sup> Export revenue based on reported export and estimated GDUoS charges.

Export meter	Value
Export, kWh	223,683
Variance to generation, kWh	-26
Variance to generation, %	-0.0%

### 3 System reporting



### 3.1 Scheme anomalies to calculated generation

Date/time	Details	Action required
08/12/2022	Plant off due to 'maximum number of shutdowns'	Alarm reset by JH
09/12/2022	Generator contractor alarms, plant not starting up normally.	Several restarts attempted by JH. Consistent problems with generator synchronisation. Plant turned off awaiting CINK feedback.
12/12/2022	Plant offline pending fault diagnosis.	CINK and Alva diagnosing problem. IES contacted to attend site.
21/12/2022	All intake sensors failed	Fuses replaced by NT on 22/12
26/12/2022	Intake 1 sensors failed	NT switched to chamber 2 control DT attended on 28/12 to replace fuses JH returned to chamber 1 control on 9/1

### 3.2 Other system events

Date/time	Details	Action required
08/12/2022	On site for caretaker training.	None
13/12/2022	IES on site to conduct initial fault diagnosis with support from Alva and GHC. Identified that ACB may be faulty.	Alva commissioning engineer to make assessment when available. RB Switchgear contacted.
15/12/2022	IES on site to conduct further fault diagnosis with support from Alva and GHC. Confirmed that ACB is faulty.	RB Switchgear asked to visit site.
22/12/2022	RB Switchgear on site.	ACB closing coil replaced.

### 3.3 Head loss

Target head loss at full power	Current head loss at full power	Status
14.5m	14.20m	Slight increase. Within target.

### 3.4 Temperatures

Parameter	Temperature at or near full power, °C	Alert level, °C	Parameter	Temperature at or near full power, °C	Alert level, °C
Generator DE bearing	32	85	Generator winding 1	61	145
Generator NDE bearing 1	37	85	Generator winding 2	58	145
Generator NDE bearing 2	41	85	Generator winding 3	62	145
Turbine room	16	30	Power cabinet (RG1)	29	42

### 3.5 Vibration

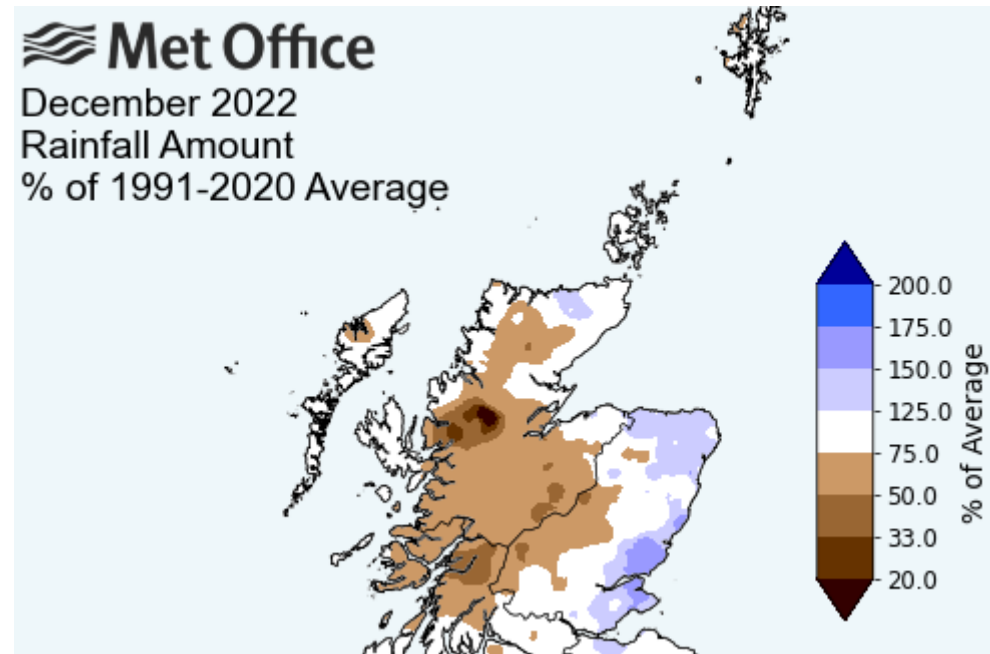
Parameter	Vibration at or near full power, mm/s	Alert level, mm/s	Parameter	Vibration at or near full power, mm/s	Alert level, mm/s
Generator DE	0.44	3.0	Generator NDE	1.19	3.0

### 3.6 Recommended and ongoing actions

Action	Responsibility	Status
Install power quality monitoring equipment at grid connection to address grid trips affecting the generator breaker and requiring a site visit.	GHC	GHC continuing to liaise with SSE. SSE have agreed and are due to fit monitoring equipment imminently.
Services to be arranged	MorVolts (refer to email from John on 2/11/22)	Electrical checks (non-PAT) conducted on 12/1/22. Quotation received for comms servicing and accepted. Scotia Handling appointed to do LOLER checks in late February.
Fire extinguisher testing	MorVolts	To be arranged
Order replacement level sensors	MorVolts	Link to replacement sensors sent to AR. AR to confirm if these have been ordered.
Investigate meter reading errors and discrepancies in export billing	GHC	JH continuing to chase Engie. Synthesized data has been sent for all gaps identified by Engie. Confirmation of whether this data has been accepted and billed awaited from Engie. No detail provided on the source of the problem – Engie blaming the data collector. Data collector representative has recently changed.
Chase SSE for details of planned outage in 2024	GHC	SSE have provided further details, JH has forwarded to NT and AR. RH will follow up with SSEN at meeting in January.
Housekeeping in turbine house	MorVolts	Cupboard to be purchased and spares stored in there. Tools to be arranged.
Generator grease reservoir almost empty	MorVolts	Grease reservoir refilled with AGIP GR MU EP2 (there should be cartridges in the box)
Teamviewer licence issues	MorVolts	Licence issues prevented access to SCADA by Glen Hydro (John can connect ok, but others receive a licence error) and Douglas. Nick to check licence situation and advise.
Powerhouse temperature dropped to 1C on 8/12/22 and 14/12/22	MorVolts	MorVolts to check frost setting of heaters and adjust if necessary.
Spares stock to be reviewed	GHC	CINK asked to review spares list and advise if any other spares recommended.

		<p>RB Switchgear provided spares proposal for generator breaker, MorVolts to procure.</p> <p>RB Switchgear to provide spares proposal for transformer breaker, GHC to confirm transformer breaker specification.</p>
ACB servicing to be implemented	GHC	<p>RB Switchgear to provide quotation for servicing and other associated electrical checks. ACB servicing to be added to maintenance schedule.</p>
Maintenance schedule and training to be reviewed	GHC	<p>CINK to check maintenance schedule including inconsistencies relative to alarm messages. CINK to confirm scope of caretaker tasks and training/documentation required. MorVolts to review and advise whether further training/documentation required.</p>

## 4 Rainfall



Rainfall this month (rain gauge), mm	48
Western Scotland rainfall in month with respect to 1991-2020 long term average	89%

## 5 Scheme annual performance summary

FY 2022/3	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	YTD
Actual generation kWh	247,605	424,386	286,501	329,058	257,505	238,578	692,787	709,873	223,709				3,410,002
Average generation since commissioning	247,605	424,386	286,501	165,261	174,610	297,736	672,489	693,043	368,179	555,764	647,905	240,688	3,329,808
Forecast generation (P50)	369,360	226,766	188,561	195,146	280,601	387,431	582,631	618,214	620,057	695,941	554,678	611,047	3,468,767
Actual relative to forecast	67.0%	187.1%	151.9%	168.6%	91.8%	61.6%	118.9%	114.8%	36.1%				98.3%
Rainfall relative to 1991-2020 average	77%	126%	104%	74%	65%	93%	134%	112%	89%				97%
Calculated generation kWh	253,540	432,296	294,437	330,341	257,587	239,724	700,013	748,966	295,507				3,552,412
Variance to calculated generation kWh	-5,935	-7,910	-7,936	-1,283	-82	-1,146	-7,226	-39,093	-71,798	-	-	-	-142,410
Variance to calculated generation %	-2.3%	-1.8%	-2.7%	-0.4%	-0.0%	-0.5%	-1.0%	-5.2%	-24.3%				-4.0%
Approximate revenue <sup>1</sup>	£28,994	£50,244	£33,677	£38,789	£30,177	£27,894	£108,061	£111,449	£34,832	-£821	-£821	-£821	£456,923
Capacity factor (monthly)	20.5%	39.0%	23.8%	28.2%	21.4%	20.5%	57.5%	60.9%	18.6%				31.9%
Industry wide RoR capacity factor	19.4%	34.6%	18.3%	15.5%	15.5%	11.9%	55.8%						24.4%

<sup>1</sup>Export element of revenue updated to reflect actual export and rate.

