Barr River hydro scheme

Monthly report – September 2021

1 Summary

A month of completion and optimisation. Intake 3 and the minor intakes were connected in the first half of the month. Chamber levels and the control intake were adjusted throughout the second half of month with various configurations tested to determine the optimal arrangement. River level to power relationship has been implemented but is still being tuned, so the relationship is not ideal. All operating parameters (temperatures, vibration etc) are within expected ranges.

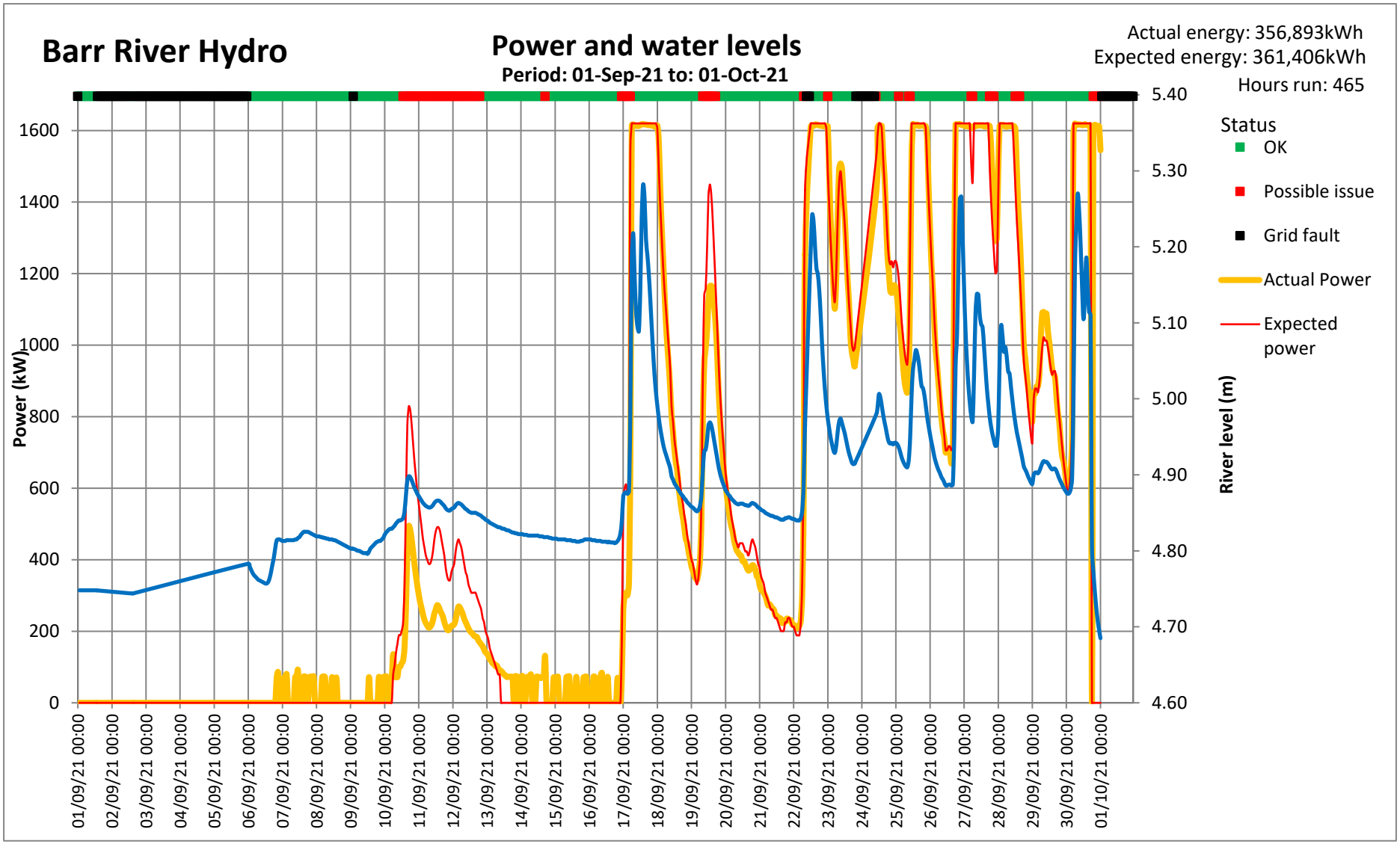
2 Monthly generation & revenue

Parameter	Value
Actual generation (FIT meter), kWh	356,893
Average generation in month, kWh	356,893
Forecast generation in month (P50), kWh	358,000
Actual relative to forecast	99.7%
Rainfall relative to 1981-2010 average by month	79.0%
Calculated generation[1] kWh	361,406
Actual relative to calculated generation, kWh	- 4,513
Actual relative to calculated generation, %	-1.2%
Approximate revenue in month	£ 59,530

[1] 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.

Export meter	Value
Export, kWh	Data awaited
Variance to generation, kWh	Data awaited
Variance to generation, %	Data awaited

3 System reporting



3.1 Scheme anomalies to calculated generation

Date/time	Details	Action required
1/9/21	Power off while SSEC on site and Perspex panel is fitted in RG1.	None
2/9/21 – 5/9/21	SCADA crashed. Water level low throughout, no operation.	SCADA restarted by Nick.
9/9/21	Grid outage.	None
10/9/21 – 12/9/21	Plant running but intake 2-3 not yet connected.	None
14/9/21	Power higher than expected (sensor resolution/rounding).	None
16/9/21 – 17/9/21	Intake 2 spilling.	Review control levels and which is master intake.
19/9/21	Intake 2 spilling.	Review control levels and which is master intake.
22/9/21	Grid outage, transformer breaker tripped.	Breaker reset by John.
23/9/21	Power higher than expected. Grid outage, transformer breaker tripped.	Breaker reset by Angus.
25/9/21	Power less than expected, power vs river level relationship 'in training'.	Review power vs. river level relationship when more data available.
27/9/21, 28/9/21	Power higher than expected.	None
30/9/21	Sensor offsets changed – power vs. river level relationship changed.	Update power vs. river level relationship to accommodate offset.

3.2 Other system events

Date/time	Details	Action required
2/9/21 – 14/9/21	MNx intakes connected.	None
13/9/21	Intake 3 connected.	None
20/9/21	Master intake changed from intake 1 to 2.	None
30/9/21	Sensor offsets changed to change order on SCADA.	None

3.3 Head loss

Target head loss at full power	Current head loss at full power	Status
14.5m	11.5m	Better than specified (as expected for a new pipeline).

3.4 Temperatures

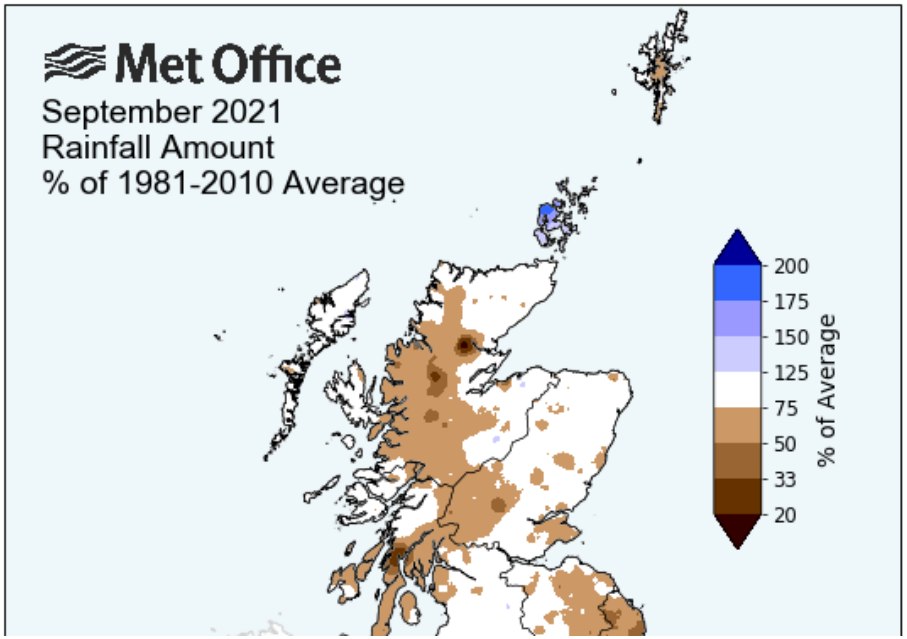
Parameter	Temperature at or near full power, ^{0}C	Alert level, ^{0}C		Parameter	Temperature at or near full power, ^{0}C	Alert level, ^{0}C
Generator DE bearing	36	85		Generator winding 1	61	145
Generator NDE bearing 1	37	85		Generator winding 2	59	145
Generator NDE bearing 2	41	85		Generator winding 3	63	145
Turbine room	17	30		Power cabinet (RG1)	30	42

4 Recommended and ongoing actions

Action	Responsibility	Status
Commissioning/testing to be completed when sufficient water available	CINK	Ongoing
Scheme operation to be reviewed when sufficient water available	GHC	Largely completed, chamber level control still under review
Modify generator/transformer breaker settings so that generator breaker trips first	GHC	Completed (29/9/21)

5 Rainfall

Rainfall this month (rain gauge), mm	178
Western Scotland rainfall in month with respect to 1981-2010 long term average	79%



6 Scheme annual performance summary

2021	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year to date
Actual generation kWh							1,463	91,714	356,893				451,887
Average generation since commissioning							1,463	91,714	356,893				451,887
Forecast generation (P50)	783,000	655,000	592,000	318,000	186,000	176,000	174,000	237,000	358,000	584,000	634,000	659,000	769,000
Variance to forecast							0.8%	38.7%	99.7%				58.8%
Rainfall relative to 1981-2010 average by month							37.0%	69.0%	79.0%				61.7%
Calculated generation kWh								91,458	361,406				452,864
Variance to calculated generation kWh	-	-	-	-	-	0	0	256	-4,513	-	-	-	-2,440
Variance to calculated generation %						+0.0%	+0.0%	+0.3%	-1.2%				+0.3%
Approximate revenue	£-	£-	£-	£-	£-	£-	£186	£12,546	£59,530	£-	£-	£-	£72,565
Capacity factor (monthly)							0.1%	7.6%	30.6%				12.8%
Industry wide RoR capacity factor	30.8%	39.3%	45.0%	14.6%	20.0%	6.5%	5.6%	15.2%					22.1%