Barr River hydro scheme

Monthly report – December 2021

1 Summary

A mixed month with a good amount of rain in the first half but very little in the second half meant that the December target was not quite reached. The performance of the scheme was good with almost continuous operation throughout the month and no trips or lost generation. The reliability of the SCADA was much improved, with no crashes this month, although that is not the case more recently. The comparison of expected and actual performance suggests that there is room for improvement, however this is affected by calibration of the expected performance formula. We expect the as built survey data from DA Macdonald imminently and will be able to review calibration when that has been received.

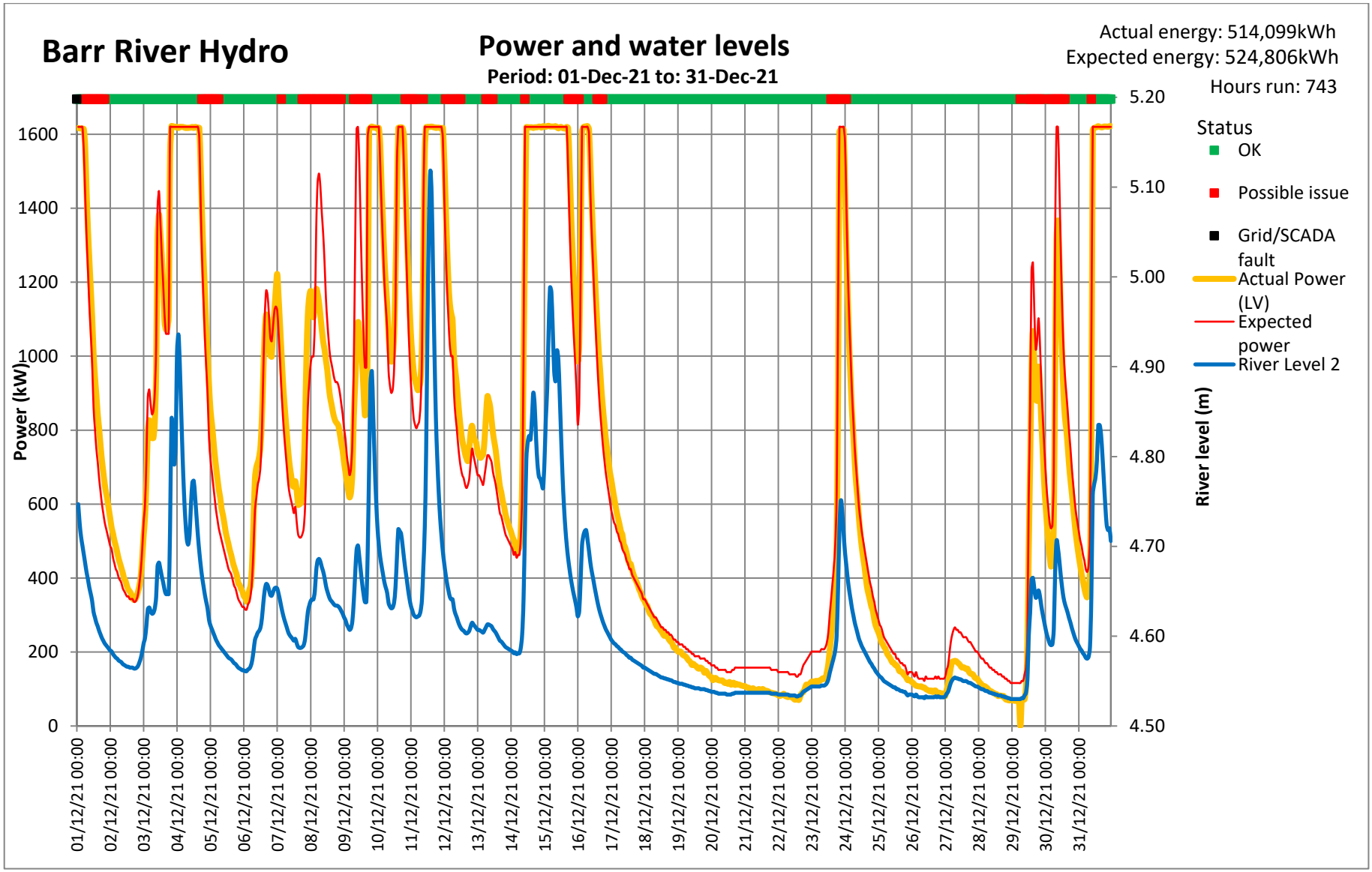
2 Monthly generation & revenue

Parameter	Value
Actual generation (FIT meter), kWh	514,099
Average generation in month, kWh	514,099
Forecast generation in month (P50), kWh	659,000
Actual relative to forecast	78.0%
Rainfall relative to 1991-2020 average by month	81.0%
Calculated generation[1] kWh	524,806
Actual relative to calculated generation, kWh	- 10,707
Actual relative to calculated generation, %	-2.0%
Approximate revenue in month	£ 66,854

[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	427,393
Variance to generation, kWh	-86,706
Variance to generation, %	-16.9%

3 System reporting



3.1 Scheme anomalies to calculated generation

Date/time	Details	Action required
1/12/21 4/12/21 7/12/21	Power higher than expected.	Review power versus river level relationship after chamber 2 sensor calibration/spill level check.
8/12/21 9/12/21	Power less than expected, due to more water available at intake 2 than intake 1.	Check chamber 2 sensor calibration to confirm spill level.
10/12/21 12/12/21 13/12/21 15/12/21 16/12/21	Power higher than expected.	Review power versus river level relationship after chamber 2 sensor calibration/spill level check.
23/12/21	Power less than expected, due to more water available at intake 2 than intake 1.	Check chamber 2 sensor calibration to confirm spill level.
29/12/21	Turbine stopped as not enough water available.	Review power versus river level relationship after chamber 2 sensor calibration/spill level check.
29/12/21 30/12/21 31/12/21	Power less than expected, due to more water available at intake 2 than intake 1.	Check chamber 2 sensor calibration to confirm spill level.

3.2 Other system events

Date/time	Details	Action required
2/12/21	Export meter data gaps queried.	Engie to request data re-read.
3/12/21	Chamber target level reduced to reduce spilling at intake 2.	Continue to review.

3.3 Head loss

Target head loss at full power	Current head loss at full power	Status
14.5m	12.77m	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	34	85		Generator winding 1	62	145
Generator NDE bearing 1	37	85		Generator winding 2	59	145
Generator NDE bearing 2	41	85		Generator winding 3	64	145
Turbine room	19	30		Power cabinet (RG1)	30	42

3.5 Vibration

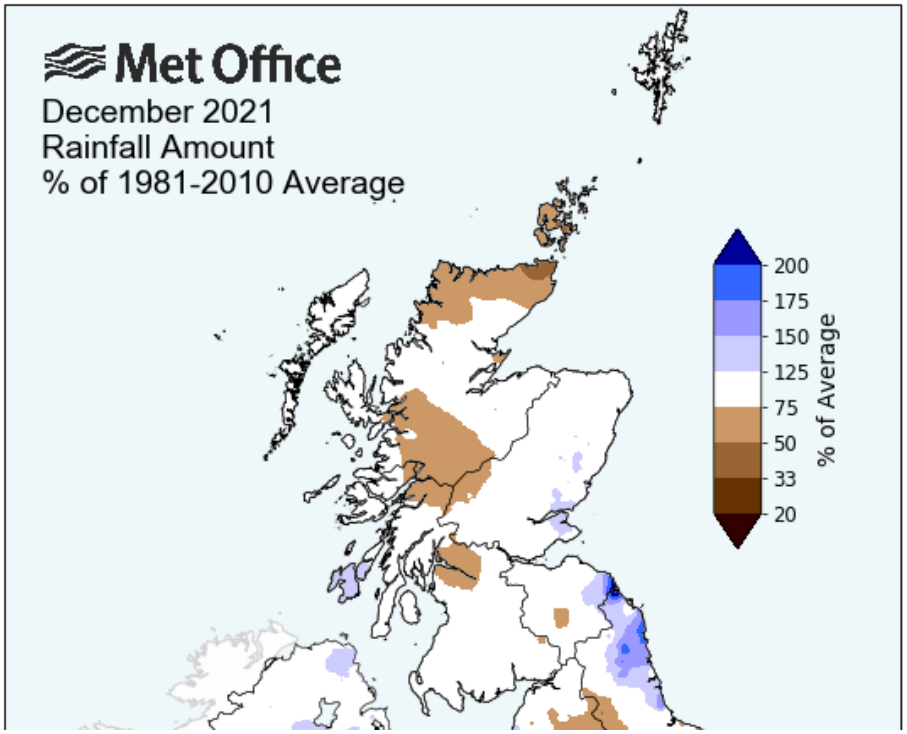
Parameter	Vibration at or near full power, mm/s	Alert level, mm/s		Parameter	Vibration at or near full power, mm/s	Alert level, mm/s
Generator DE	0.38	3.0		Generator NDE	1.20	3.0

4 Recommended and ongoing actions

Action	Responsibility	Status
Check sufficient stock of spare 50mA fuses for level sensors	MorVolts	Ongoing
Fuses to be labelled clearly in X91 (signal cable junction box in powerhouse)	MorVolts	Ongoing
Check chamber 2 level sensor calibration to confirm spill level	GHC	Target level under review to reduce spill risk. Gauge board/spill level calibration to be checked when as built data available.
Chase missing export meter data for November and December	MorVolts	Ongoing

5 Rainfall

Rainfall this month (rain gauge), mm	183
Western Scotland rainfall in month with respect to 1991-2020 long term average	81%



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	652,190	676,213	514,099	1,778,473
Average generation since commissioning							1,463	91,714	356,893	652,190	676,213	514,099	1,778,473
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	1,987,000
Variance to forecast							0.8%	38.7%	99.7%	111.7%	106.7%	78.0%	89.5%
Rainfall relative to 1991-2020 average by month							37.0%	69.0%	79.0%	135.0%	67.0%	81.0%	77.4%
Calculated generation kWh								91,458	361,406	783,563	731,833	524,806	1,968,260
Variance to calculated generation kWh	-	-	-	-	-	0	0	256	-4,513	-131,373	-55,620	-10,707	-191,250
Variance to calculated generation %						+0.0%	+0.0%	+0.3%	-1.2%	-16.8%	-7.6%	-2.0%	-9.7%
Approximate revenue	£-	£-	£-	£-	£-	£-	£186	£12,546	£71,936	£84,812	£87,936	£66,854	£257,415
Capacity factor (monthly)							0.1%	7.6%	30.6%	54.1%	58.0%	42.7%	30.1%
Industry wide RoR capacity factor	30.8%	39.3%	45.0%	14.6%	20.0%	6.5%	5.6%	15.2%	14.0%	53.0%	53.0%		21.3%