



Barr River hydro scheme

Monthly report – February 2023

1 Summary

A relatively dry month but the plant responded well to the water available. A grid outage in the middle of the month fortunately coincided with low water levels. There was a grid and breaker trip that was quickly resolved but this was then followed by an issue with one of the spears. A workaround was put in place the same day and the plant has been operating satisfactorily since then.

2 Monthly generation & revenue

| Parameter | Value |
|---|---------|
| Actual generation (FIT meter), kWh | 447,449 |
| Average generation in month, kWh | 547,677 |
| Forecast generation in month (P50), kWh | 554,678 |
| Actual relative to forecast | 80.7% |
| Rainfall relative to 1991-2020 average by month | 56% |
| Calculated generation ¹ kWh | 459,640 |
| Actual relative to calculated generation, kWh | -12,191 |
| Actual relative to calculated generation, % | -2.7% |
| Approximate revenue in month ² | £31,298 |

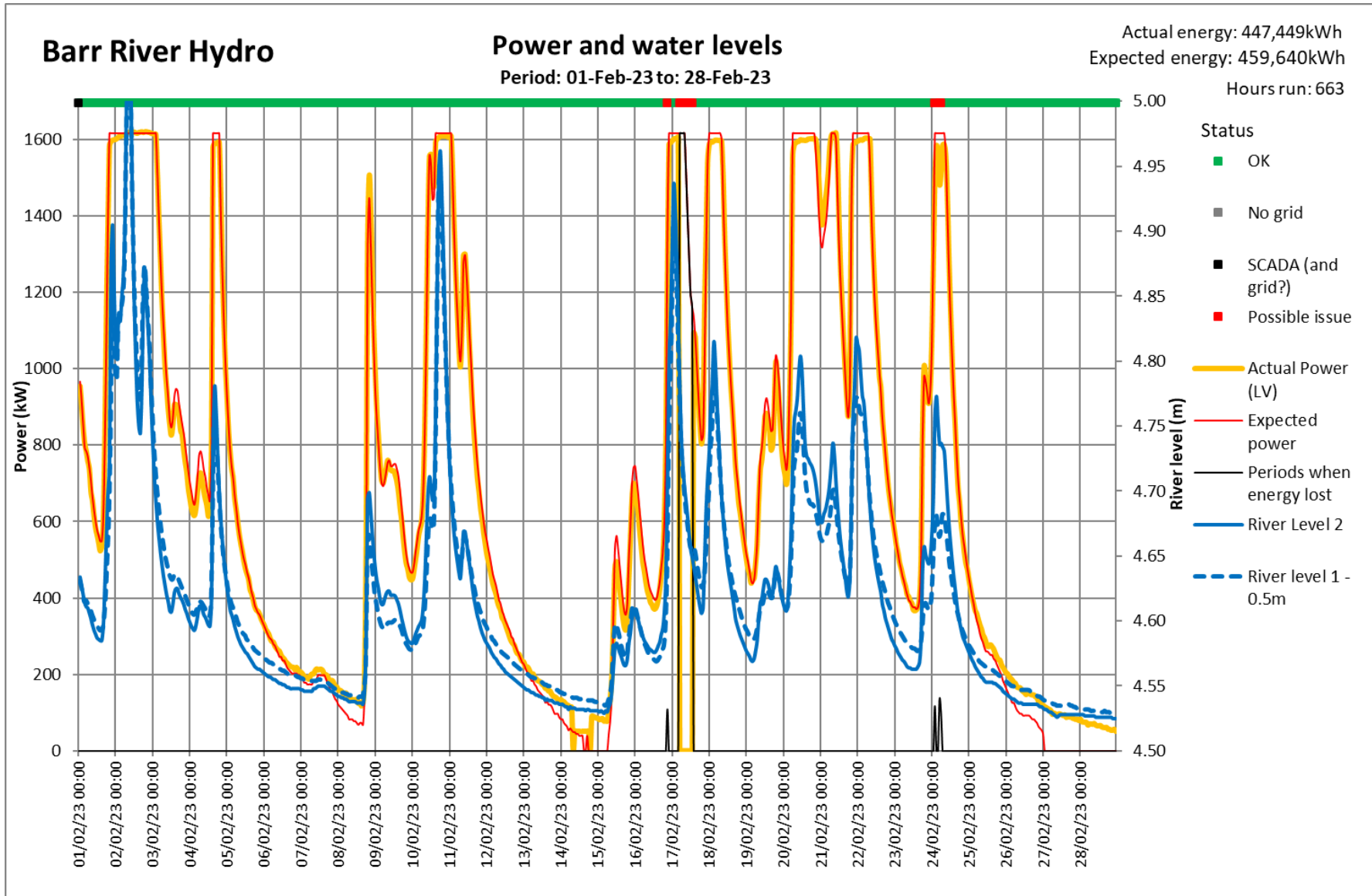
¹ Calculated generation is based on river level data and seeks to establish the expected generation with no performance issues. The expected power and energy calculations are being calibrated and will be refined over the coming months as more data is gathered.

² Export revenue based on reported export and estimated GDUoS charges.

| Export meter | Value |
|-----------------------------|---------|
| Export, kWh | 394,975 |
| Variance to generation, kWh | -52,474 |
| Variance to generation, % | -11.7% |

EDF export statement shows no missing data but reports no export from on 1st & 2nd of the month. Recorded generation during that period was 60,881kWh. Suspected ongoing issue from late January.

3 System reporting



3.1 Scheme anomalies to calculated generation

| Date/time | Details | Action required |
|------------|--|---|
| 14/02/2023 | 50kW grid constraint in place, power limited from 07:00 to 19:00 | None |
| 17/02/2023 | Various G99 issues in early morning, one trip, which it recovered from and then one that lead to breaker tripping. | NT attended and reset breaker, plant restarted ok. |
| 17/02/2023 | Issue with spear 1 opening too slowly lead to F137 trip. | CINK contacted. Alva extended timeout on spear 1. Hydraulic lines may need to be cleaned – to be addressed on next service. |
| 24/02/2023 | Power lower than expected when spears fully open. This has been an issue for some time now and has been gradually increasing in severity. Investigation has been conducted previously and recently reviewed, there is no obvious cause. Most likely cause is considered to be an issue with the spears or spear opening measurement. | CINK contacted to seek their opinion. |

3.2 Other system events

| Date/time | Details | Action required |
|----------------|---------|-----------------|
| None to report | | |

3.3 Head loss

| Target head loss at full power | Current head loss at full power | Status |
|--------------------------------|---------------------------------|---|
| 14.5m | 14.51m | Further increase. Now over target. Pigging required. Quotation requested from Stuart Stankey, to be chased. |

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 | 35 | 85 | Generator winding 1 | 62 | 145 |
| Generator NDE bearing 1 | 40 | 85 | Generator winding 2 | 60 | 145 |
| Generator NDE bearing 2 | 43 | 85 | Generator winding 3 | 64 | 145 |
| Turbine room | 18 | 30 | Power cabinet (RG1) | 28 | 42 |

3.5 Vibration

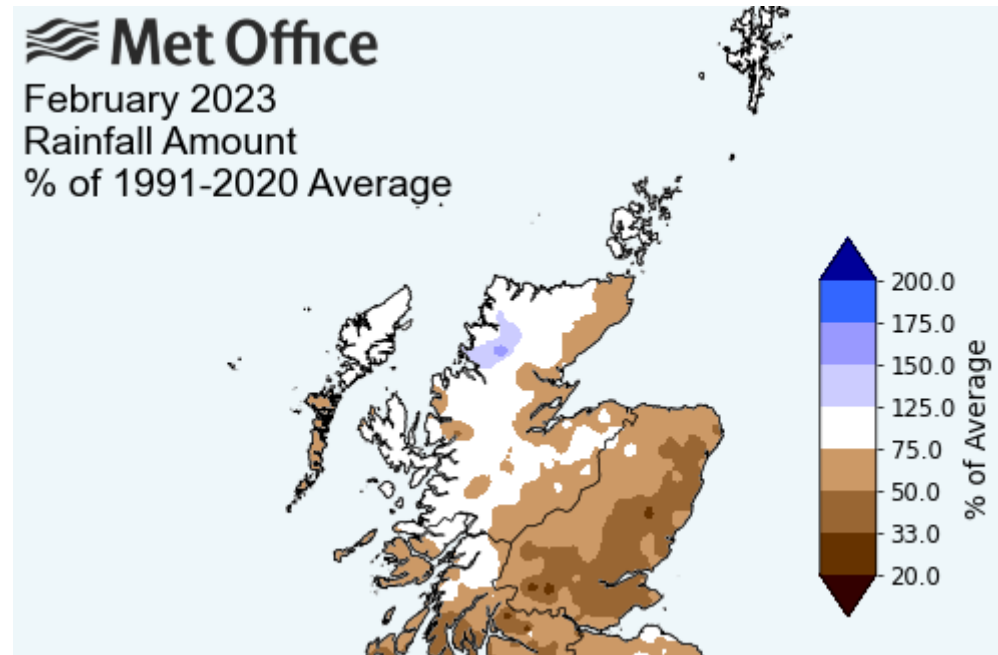
| Parameter | Vibration at or near full power, mm/s | Alert level, mm/s | Parameter | Vibration at or near full power, mm/s | Alert level, mm/s |
|--------------|---------------------------------------|-------------------|---------------|---------------------------------------|-------------------|
| Generator DE | 0.41 | 3.0 | Generator NDE | 1.12 | 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 | SSEN fitted the monitoring equipment on 6 th February. The logger will record 4 weeks' data, SSEN will then recover it and analyse that data. A trip occurred on the 17 th February, so this should have been captured by the logger. GHC to follow up with SSEN. |
| Services to be arranged | MorVolts | LOLER checks complete. MorVolts to send inspection report. |
| Fire extinguisher testing | MorVolts | To be arranged (awaiting MCDG fire extinguisher service contract for existing CO2 extinguisher only) |
| Order replacement level sensors | MorVolts | Three ordered and expected on site w/c 6/3/2023. |
| Investigate meter reading errors and discrepancies in export billing | GHC | June and August 2022 resolved and paid. |
| Chase SSE for details of planned outage in 2024 | GHC | SSE have provided further details, JH has forwarded to NT and AR. RH to provide update following SSEN meeting in January. |
| Housekeeping in turbine house | MorVolts | Spares to be arranged on shelves/in cupboard. Underway. |
| 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. MorVolts to advise if this has been addressed. |
| Spares stock to be reviewed | GHC | CINK asked to review spares list and advise if any other spares recommended – CINK chased, no response yet Generator breaker spares ordered and arrived. Transformer breaker spares requirement to be checked by RB Switchgear on next attendance (note – will require HV isolation and therefore AP attendance). |
| Ongoing ACB servicing to be implemented | GHC | Quotation from RB Switchgear accepted by MorVolts. RB Switchgear informed. Charlie Robb informed that RB Switchgear will now do transformer oil sampling. Service schedule updated. |

| | | |
|--|----------|---|
| Maintenance schedule and training to be reviewed | GHC | 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. JH to chase CINK. |
| Arrangements to be established with Colin Thwaites for HV switching/isolation | GHC | CV awaited from Colin for GHC records. Colin has visited site. |
| Plans to be put in place for pigging | GHC/DAM | JH has requested proposal from DA Macdonald for pigging. |
| Chase up export payment for late January and early February when scheme was generating but no export recorded. | Morvolts | January issues raised with EDF. |

4 Rainfall



| | |
|--|-----|
| Rainfall this month (rain gauge), mm | 138 |
| Western Scotland rainfall in month with respect to 1991-2020 long term average | 56% |

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 | 633,347 | 447,449 | | 4,490,798 |
| Average generation since commissioning | 247,605 | 424,386 | 286,501 | 165,261 | 174,610 | 297,736 | 672,489 | 693,043 | 368,179 | 594,556 | 547,677 | 240,688 | 4,472,041 |
| 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 | 4,719,387 |
| Actual relative to forecast | 67.0% | 187.1% | 151.9% | 168.6% | 91.8% | 61.6% | 118.9% | 114.8% | 36.1% | 91.0% | 80.7% | | 95.2% |
| Rainfall relative to 1991-2020 average | 77% | 126% | 104% | 74% | 65% | 93% | 134% | 112% | 89% | 104% | 56% | | 94% |
| Calculated generation kWh | 253,540 | 432,296 | 294,437 | 330,341 | 257,587 | 239,724 | 700,013 | 748,966 | 295,507 | 639,670 | 459,640 | | 4,651,722 |
| Variance to calculated generation kWh | -5,935 | -7,910 | -7,936 | -1,283 | -82 | -1,146 | -7,226 | -39,093 | -71,798 | -6,323 | -12,191 | - | -160,924 |
| Variance to calculated generation % | -2.3% | -1.8% | -2.7% | -0.4% | -0.0% | -0.5% | -1.0% | -5.2% | -24.3% | -1.0% | -2.7% | | -3.5% |
| Approximate revenue ¹ | £28,994 | £50,244 | £33,677 | £38,789 | £30,177 | £27,894 | £108,061 | £111,476 | £34,832 | £44,660 | £31,298 | £-833 | £581,222 |
| Capacity factor (monthly) | 20.5% | 39.0% | 23.8% | 28.2% | 21.4% | 20.5% | 57.5% | 60.9% | 18.6% | 52.5% | 41.1% | | 34.6% |
| Industry wide RoR capacity factor | 19.4% | 34.6% | 18.3% | 15.5% | 15.5% | 11.9% | 55.8% | 59.0% | 32.6% | | | | 29.2% |

¹Export element of revenue updated to reflect actual export and rate.

