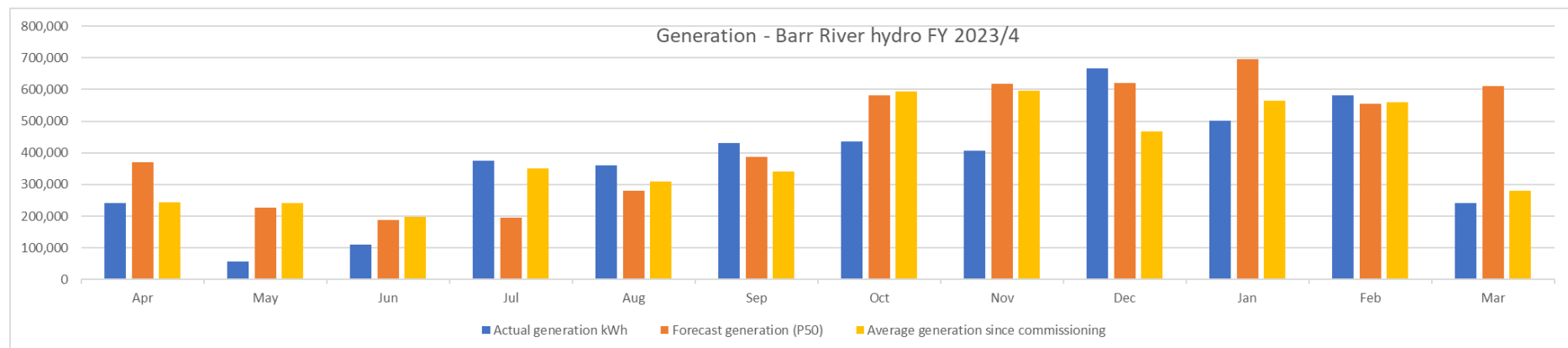


Barr River hydro scheme

Annual report – Year to March 2024

1 Summary

FY 2023/4	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Total
Actual generation kWh	240,542	57,453	111,100	374,109	360,348	431,554	434,771	406,551	667,311	502,737	582,749	241,042	4,410,267
Average generation since commissioning	244,074	240,920	198,801	351,584	308,927	342,342	593,249	597,546	467,890	563,949	559,368	279,361	4,748,008
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	5,330,433
Actual relative to forecast	65.1%	25.3%	58.9%	191.7%	128.4%	111.4%	74.6%	65.8%	107.6%	72.2%	105.1%	39.4%	82.7%
Rainfall relative to 1991-2020 average by month	83%	45%	81%	152%	73%	145%	83%	74%	137%	81%	106%	92%	96%
Calculated generation kWh	243,307	59,162	112,194	377,850	418,162	438,789	445,408	428,068	672,901	536,047	620,238	250,456	4,602,582
Variance to calculated generation kWh	- 2,765	- 1,709	- 1,094	- 3,741	- 57,814	- 7,235	- 10,637	- 21,517	- 5,590	- 33,310	- 37,489	- 9,414	- 192,315
Variance to calculated generation %	-1.1%	-2.9%	-1.0%	-1.0%	-13.8%	-1.6%	-2.4%	-5.0%	-0.8%	-6.2%	-6.0%	-3.8%	-4.2%
Approximate revenue	£32,628	£6,019	£13,639	£50,882	£49,085	£59,163	£147,478	£137,899	£227,701	£170,888	£201,076	£80,811	£1,177,270
Capacity factor (monthly)	20.6%	4.8%	9.5%	31.0%	29.9%	37.0%	36.1%	34.9%	55.4%	41.7%	53.5%	20.0%	31.2%
Industry wide RoR capacity factor	20.7%	5.7%	6.0%	27.5%	25.0%	36.0%	40.0%	45.0%	46.0%	43.3%	59.8%	37.2%	32.7%



2 Generation versus expectations & industry benchmarks

FY 2023/4	Total
Actual generation kWh	4,410,267
Average generation since commissioning	4,748,008
Forecast generation (P50)	5,330,433
Actual relative to forecast	82.7%
Rainfall relative to 1991-2020 average by month	96%
Calculated generation kWh	4,602,582
Variance to calculated generation kWh	-192,315
Variance to calculated generation %	-4.2%
Capacity factor (monthly)	31.2%
Industry wide RoR capacity factor	32.7%

Actual generation was below forecast during a period of marginally lower rainfall and also down against the long term average since commissioning. Generation capacity was below above the industry norm from a sample of hydro sites across Scotland for the same period (>50 sites), contrary to previous years where Barr has typically been slightly above the norm.

There have been no significant operational issues. The calculated generation figure is based on a site-specific equation derived from the river level sensor above the intake. It is a best estimate that will show minor variances over time. Its primary use is to highlight potential issues with the system to prompt remedial action.

3 Key events, faults & downtime

Date	Event/issue	Comment
September 2022	Alternative remote login arrangements put in place	Facilities were established and shared with MorVolts to allow direct login to the PLC HMI. This allows the performance of the scheme to be checked even when the SCADA PC has crashed.
November 2022	SCADA software changes	Alva made some changes to the SCADA software which has significantly improved the reliability and has reduced the frequency of crashes.
December 2022	ACB failure	The generator breaker failed, preventing the plant from operating. Despite occurring in the run up to Christmas, the problem was diagnosed within four working days of occurrence and resolved within five working days of diagnosis. Servicing arrangements have been put in place to reduce the likelihood of future failures and a critical spares stock is now kept on site.
February 2023	Power quality monitoring by SSEN	After a great deal of chasing, SSEN finally fitted a power quality data logger, which recorded four weeks of data, including a grid trip that led to the ACB tripping. This data has not yet been analysed; we are chasing SSEN for an update. Depending on the outcome, we may push SSEN to modify their protection settings so that we can reduce the frequency of ACB trips.
March 2023	Spear opening issue resolved	One of the spears has been opening more slowly than the others which was leading to a loss in generation when the scheme started up. This issue was finally resolved in March 2023.
March 2023	High level meeting held with SSEN regarding the three month felling outage planned for 2024	This meeting involved Directors from SSEN and raised the profile of this outage within the company.
August 2023	Pipeline pigged.	This work was instructed following monitoring of head-loss. The resulting reduction in head-loss was achieved as anticipated and continues to be monitored.
October 2023	Changes made to LOM Relay settings and transformer tapings.	This was following discussions with SSEN over the voltage data that we recorded. The changes should result in less trips of the generator breaker during grid fluctuations.

November 2023	SSEN announce that full export will be possible during the felling works at Laudale.	The constraint is lifted.
November 2023	Voltage monitoring equipment installed in Barr River powerhouse.	Related to the monitoring work that SSEN have failed to do over the past year.
January 2024	Two day unplanned outage called by SSEN due to grid fault	This was one in a series of short outages by SSEN, but the first to be unplanned, due to a fault on the network