



Westmill Solar Park

Quarterly Report – January, February and March
2019

Westmill Solar Cooperative

April 2019

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Issue and Revision Record

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Executive Summary

RINA Consulting has been appointed by Westmill Co-operative (the 'Client' or 'Westmill') to undertake the Technical Asset Management for the PV Plant Westmill Solar Farm (the 'Plant'). The Operation and Maintenance (O&M) services have been undertaken by British Solar Renewables (BSR) commencing on 1st December 2017.

Plant performance

Measured irradiation for the first quarter in 2019 (Q1 2019) was higher than the expected P50 values, the observed performance ratio (PR) was also higher, and subsequently the project exceeded the forecasted quarterly generation figure. The Q1 2019 irradiation, PR and generation values exceeded their equivalent Q1 2018 figures.

Actual availability each month within the period exceeded the target availability level of 99.0% with the exception of February 2019 where the availability was noted to be 0.1% lower than the target availability. Quarterly availability figure was 99.6%, 0.6% higher than the equivalent period in 2018.

Contractor performance

The O&M contractor has undertaken all their contracted works according to their schedule and highlighted issues as they have arisen.

Metering

Communications with the FIT Meter previously read by Metermanager remains an open issue. This was scheduled to coincide with BSR completing migration of monitoring to their own bespoke monitoring system and whilst this is now a live system it is not possible to communicate with the meter so an alternative arrangement will need to be made. This should be able to utilise either an existing broadband line to site or with a change of meter (from Premier to Ester) could be read by Metermanager. Both systems will be costed in order to resolve this issue.

Security

In early March 2019 a hole was discovered in the perimeter fence by Adam Twine, the landowner, on the eastern side of the site. Following discussion with BSR they offered their technical services to replace the fence panel and its replacement was installed on 22nd March 2019.

The camera system requires upgrading for camera 5/3 due to an intermittent fault causing poor service. An order has been placed with Westronics to rectify the camera system fault and also replace a damaged beam sensor (located at the south western section of the site). Westronics also advise of slow broadband communications that impact the camera system and further investigation with BT should address this issue.

Groundworks

The BSR monthly report(s) indicated that there was apparent further rabbit activity. A follow-up visit in conjunction with RINA is scheduled for April 2019. The findings of this visit will be communicated in our next report.

1 Introduction

RINA Consulting Limited ('RINA'); has been appointed by Westmill Co-operative (the 'Client' or 'Westmill') to undertake the Technical Asset Management for Westmill Solar Farm (the 'Plant').

The document is a quarterly review of the Plant operational performance for the first quarter of 2019, including the following items:

- Plant performance analysis
- Plant operations
- A review of maintenance activities

2 Plant Performance Analysis

RINA has analysed irradiation, plant generation, PR and availability and reviewed the main events affecting the plant. The performance of the Plant is presented below with the previous year comparison.

2.1 Irradiation

Irradiation is measured using the in-plane Kipp & Zonen pyranometer on the Plant. The pyranometer is of secondary class which represents the most accurate classification for the measurement of irradiation. Actual irradiation measured on site has been compared with the P50 irradiation taken from the original yield study undertaken by RINA.

Table 1: P50 irradiation and measured irradiation

Month	P50 expected irradiation (kWh/m ²)	Irradiation measured from monitoring system (kWh/m ²)	Delta (%)
Jan	48	40	-16.9%
Feb	65	81	24.4%
Mar	95	104	9.0%
Q1 2019 Total	208	224	7.8%
Q1 2018 Total	208	190	-8.7%

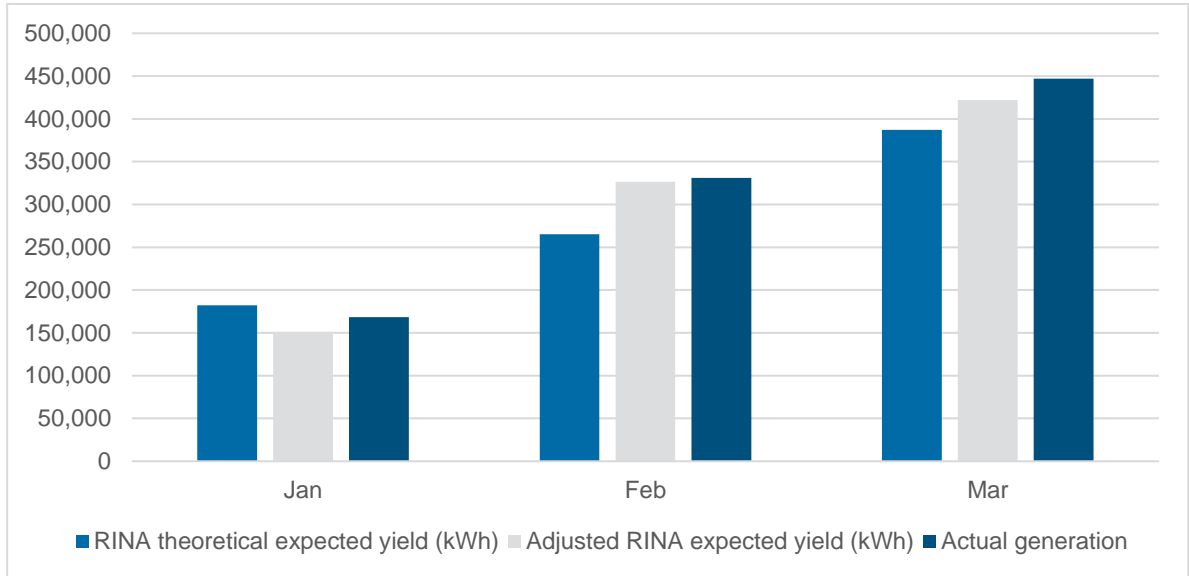
2.2 Production

Table 2: Monthly generation

Month	RINA theoretical expected yield (kWh)	Adjusted RINA expected yield (kWh)	Actual generation (kWh)	Delta actual vs expected (%)	Delta actual vs adjusted (%)
Jan	182,178	151,314	168,264	-7.6%	11.2%
Feb	265,289	326,405	330,969	24.8%	1.4%
Mar	387,269	421,956	447,007	15.4%	5.9%
Q1 2019 Total	834,736	899,675	946,240	13.4%	5.2%
Q1 2018 Total	838,171	767,726	789,064	-5.9%	2.8%

Figure 1 compares the expected yield from the original yield study and actual plant generation for the quarter. The expected yield is then adjusted with the actual irradiation and availability data for the period to show the adjusted RINA expected yield (kWh). Actual plant generation is taken from the DNO export meter readings which have been verified using the Skytron monitoring system for each month of the period.

Figure 1: Monthly generation



2.3 Performance Ratio

Table 3: Performance ratio including downtimes

Month	RINA expected PR (%)	PR guaranteed (%)	Actual PR incl. downtimes (%)	Delta Actual to RINA expected (%)
Jan	76.1%	77.3%	84.6%	11.2%
Feb	81.8%	77.3%	82.0%	0.3%
Mar	81.7%	77.3%	86.6%	5.9%
Q1 2019 Total	80.5%	-	84.6%	5.1%
Q1 2018 Total	80.8%	-	83.1%	2.8%

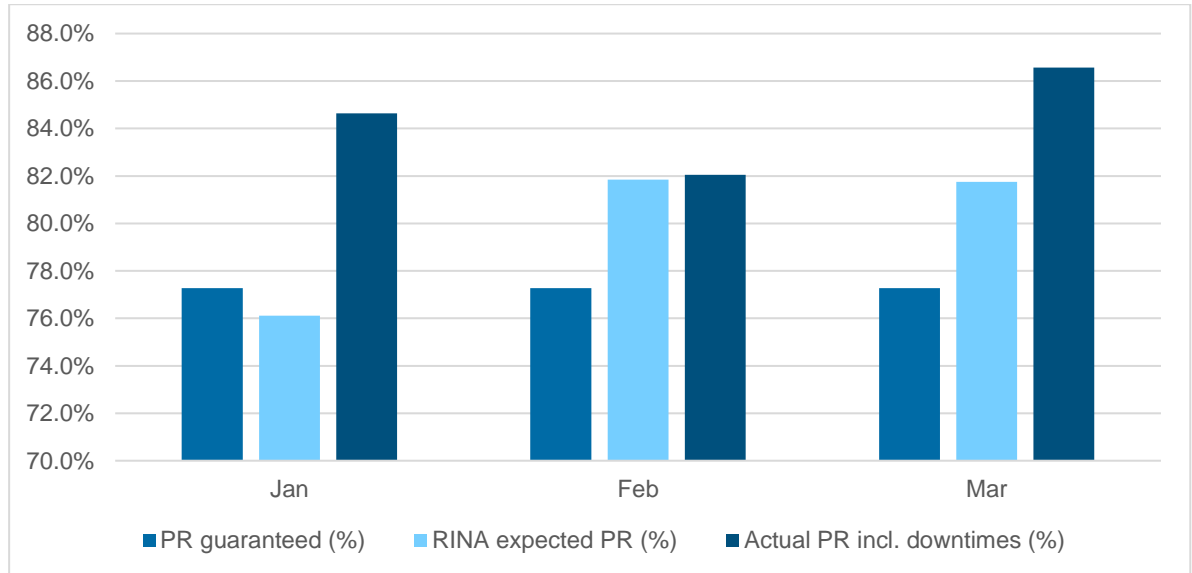
Figure 2: PR analysis including downtime


Table 4 below shows the Plant expected, guaranteed and actual PR values for this quarter, excluding downtimes, to reflect the Plant's performance without periods of Plant unavailability.

Table 4: Performance ratio excluding downtimes

Month	RINA expected PR (%)	PR guaranteed (%)	Actual PR excl. downtimes (%)	Delta Actual to RINA expected (%)
Jan	76.1%	77.3%	84.6%	11.2%
Feb	81.8%	77.3%	83.0%	1.4%
Mar	81.7%	77.3%	86.6%	5.9%
Q1 2019 Total	80.5%	-	84.9%	5.5%
Q1 2018 Total	80.8%	-	83.3%	3.1%

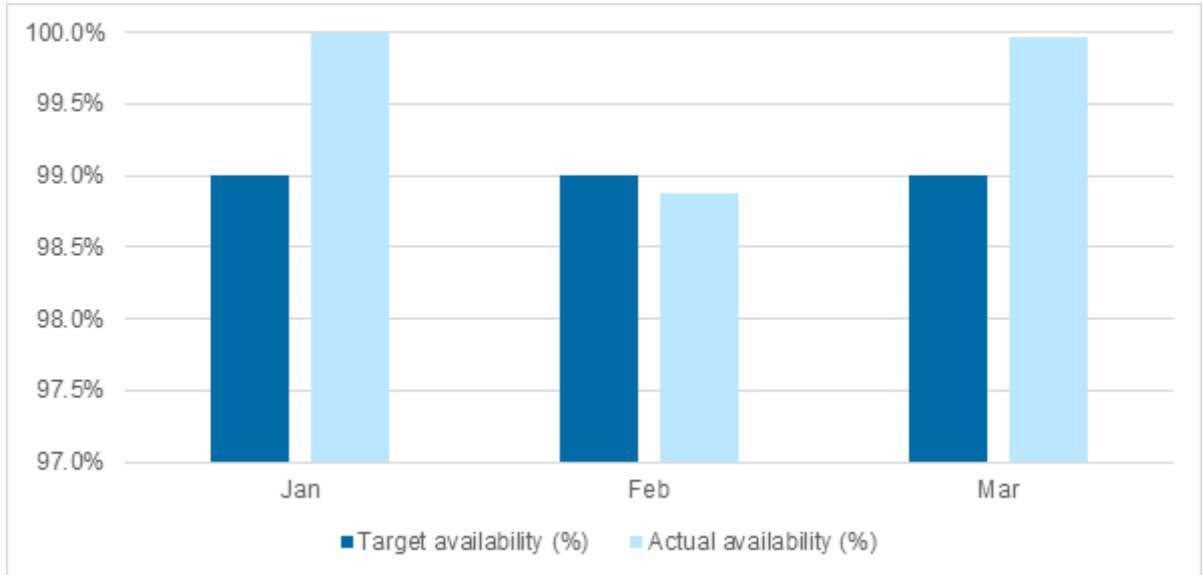
2.4 Availability

Table 5 and **Error! Reference source not found.** show the target and actual availability of the Plant.

Table 5: Target and actual availability

Month	Target availability (%)	Actual availability (%)	Difference (%)
Jan	99.0%	100.0%	1.0%
Feb	99.0%	98.9%	-0.1%
Mar	99.0%	100.0%	1.0%
Q1 2019 Total	99.0%	99.6%	0.6%
Q1 2018 Total	99.0%	99.8%	0.8%

Figure 3: Target and actual availability



Based on the information received from British Solar Renewables O&M (BSR O&M), availability in February 2019 was low due to the DNO outage (reference number: F19-401-A) at Westmill Solar Park from 08:00 to 18:45 on 9th February 2019 which affected all the inverters. One of the inverters (Inverter 04) did not start with the rest of the inverters at 18:45 on 9th February 2019, instead it was back online on 13:00 of 10th February 2019. Moreover, due to snow settlement on 1st February 2019 there wasn't any generation for half of the day.

2.5 Performance summary

The comparison for irradiation, PR, generation and availability figures against the expected values for the period are summarised below including a comparison with the equivalent values from the previous year.

Table 6: Performance summary with previous year comparison

	Irradiation	PR excl. downtime	Generation	Actual availability
Q1: 2019 Actual vs expectation	+7.83 %	+4.45 %	+13.36 %	+0.61 %
Q1: 2019 vs 2018	+18.05 %	+1.62 %	+19.92 %	-0.15 %

The measured irradiation has shown a year-on-year increase for this period, with PR and generation values higher than expectations. Availability was marginally less than the previous year quarterly value, however higher than the quarterly target. It should be noted that actual availability each month within the period exceeded the target availability level of 99.0% with the exception of February 2019 where the availability was noted to be 0.1% lower than the target availability.

3 Plant Operations

Summarises the operations and status of recorded operational events that affected the Plant during the period.

Table 7: Operational events list

No.	Description	RINA Comments	Progress/Status
1	Security Beam Sensor	A security beam is inoperative due to damage and an order has been raised with Westronics for a replacement.	New beam unit to be installed once replacement parts are available, which we understand should be imminent
2	Security Camera System	Intermittent faults with camera 5/3 (5 daytime, 3 infrared both within the same unit) diagnosed as cable corrosion.	Westronics indicate the most cost effective resolution is to install a wireless replacement, avoiding extensive excavations. An order has been raised and the installation will commence once the parts are available, which we understand should be imminent.
3	Evergreen Rabbit Control - rabbit removal	Evergreen Rabbit Control completed a final follow up visit during early October 2018 and only 2 rabbits were found and removed. Due to further reports (by BSR) a site visit will review the current status.	RINA & Evergreen Rabbit Control will survey the site in April 2019 and review findings regarding any rabbits or ongoing damage.

4 Operational Activities

4.1 Preventative maintenance

Preventative maintenance activities were carried out in accordance with the schedule and this remains broadly on track.

4.2 Groundworks

The BSR monthly report(s) indicated that there was apparent further activity from rabbits at various places across the site. A further visit by Evergreen Rabbits was delayed in February and March due to the grazing of sheep across the site. This had two benefits, firstly that the dogs would not be worrying the sheep (although the shepherd seemed unconcerned regarding this point) if there were rabbits there to catch and secondly that the sheep will have reduced the height of grass leaving nowhere for the rabbits to hide when flushed from their burrows, should there be any. During the visit by Evergreen Rabbits in October 2018 only two rabbits were found. The visit is now scheduled to be completed in April 2019 and a further update will be communicated in our next report.

4.3 Security

- In early March 2019 Adam Twine, the landowner, advised that he had discovered a hole in the perimeter fence on the eastern side of the site. Whilst a fencing contractor was being sought RINA were advised that BSR technicians had also come across this issue during their routine visit on 14th March 2019. Following discussion with BSR they offered their technician services to replace the fence panel and as a result the replacement was installed on 22nd March 2019. The panel used was part of the spare panel stock retained on site. There appeared to be no instances of attempted break-ins at either the HV room or wooden shed. This issue has been followed up with Westronics as there also appeared to be a fault with the camera adjacent to the damaged fence panel. However, even without a camera the beam sensor should have been alerted but there had been no mobilising of Elite Security by the monitoring centre. Feedback from Westronics indicates that alerts were received by the monitoring station. Westronics confirmed that the system is operational, other than the issue with the camera 5/3 (this is combines day & night camera) and one damaged beam sensor on the south western part of the site (further details below).
- The camera system requires some upgrading work as the cabling between cameras 5/3 is giving intermittent service and the order for this works has been placed with Westronics. The replacement will be installed once parts are available and will result in this camera then having a wireless connection to the onsite recording/remote monitoring system. A damaged beam sensor located at the south western section of the site will also be replaced. Westronics have advised that the broadband speed to site remains slow despite being upgraded during early 2017. Further discussion will be undertaken with BT to seek a long-term improvement in this service.

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