



# Westmill PV Plant Asset Management

Q3 2016 - July, August, September

Westmill Solar Co-op Ltd.

October 2016

00280 V1

## Issue and Revision Record

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Our commitment to excellence in our work has been recognised through a series of annual awards from our foundation in 2008 to today, including recently:



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## Executive Summary

OST Energy ('OST') 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 historically been provided by Abakus Solar Manchester Limited. Encome Energy Performance GmbH, headquartered in Klagenfurt, Austria acquired the German based Abakus Solar in July 2016 and as a consequence of the acquisition also acquired 100% of Abakus Solar Manchester Limited. Encome will therefore continue delivering the O&M services previously contracted to Abakus Solar Manchester Limited.

It is not expected that this will have any impact on the operational performance of the site and could potentially see an improved level of maintenance response.

### Plant performance

Measured irradiation was much higher than the expected for July and August and lower than expected during September. Overall irradiation for the Quarter was above the expected level. Compared to measured irradiation observed on site for the same period last year, irradiation is higher in 2016.

Generation for July and August was higher than expected, reflecting the higher irradiation levels for these months. Despite a lower than expected level of generation in September the overall figure for the period was above expected generation and also above that seen during the same period in 2015.

### Contractor performance

The contractor has undertaken all their contracted works according to their schedule and there are no outstanding issues. OST shall continue to monitor the monthly reporting to ensure alignment with the monitored performance of the site as well as the data supplied from Good Energy.

Availability for the Quarter is reported to be 99.60% which exceeds the target availability of 99%.

### Rodent infestations

Quotations against the rodent infestation reported in Q2 report have not materialised. This has been followed up in the report from the October 12th site visit, submitted alongside this report

### Module cleaning

The condition of the panels shall be reported in the forthcoming site visit planned at the in October 2016

### Abakus performance premium

The bonus for the quarter has been submitted by Encome and verified by OST and is confirmed to be £124,369.63. The calculation by Encome (Abakus) is attached

# 1 Introduction

OST Energy has been appointed by Westmill Co-operative (the 'Client') to undertake Technical Asset Management for the Westmill Solar PV Farm (the 'Plant') in the UK.

The document is a Quarterly review of the Plant operational performance, including the following items:

- Plant Performance Analysis
- Plant Operations
- A review of Maintenance activities
- Review of spare parts
- Review of Warranties and Service Agreements
- Encome (formerly Abakus) Annual Performance Premium

## 2 Plant Performance Analysis

In this section, OST has analysed plant generation, irradiation, PR and availability and checked the main events affecting the plant. The performance of the Plant is presented with analysis and comments.

### 2.1 Irradiation

Irradiation has been measured using the one 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 OST.

**Table 1: P50 irradiation and measured irradiation**

Month	P50 Expected Irradiation (kWh/m <sup>2</sup> )	Irradiation measured from monitoring system (kWh/m <sup>2</sup> )	Delta (%)
July	151.00	162.33	7.50%
August	134.00	155.40	15.97%
September	113.00	99.02	-12.37%
Q3 2016 Total	398.00	416.75	4.71%
Q3 2015 Total	398.00	387.37	-2.67%

Measured irradiation was higher than the expected irradiation for July and August whilst falling below expectation for September. Overall irradiation for the Quarter was higher than the expected level. Compared to measured irradiation observed on site for the same period last year, irradiation is higher in 2016.

### 2.2 Production

Table 2 and

Month	OST theoretical expected yield (kWh)	Adjusted OST expected yield (kWh)	Actual generation	Delta actual gen. vs expected gen. (%)	Delta actual gen. vs adjusted gen. (%)
July	592,774	636,354	665,078	7.5%	12.2%
August	523,900	606,998	627,650	16.0%	19.8%
September	447,318	391,613	402,772	-12.4%	-10.0%
<b>Q3 2016 Total</b>	<b>1,563,992</b>	<b>1,634,965</b>	<b>1,695,500</b>	<b>11.1%</b>	<b>22.0%</b>
<b>Q3 2015 Total</b>	<b>1,570,490</b>	<b>1,521,717</b>	<b>1,647,000</b>	<b>16.4%</b>	<b>24.84%</b>

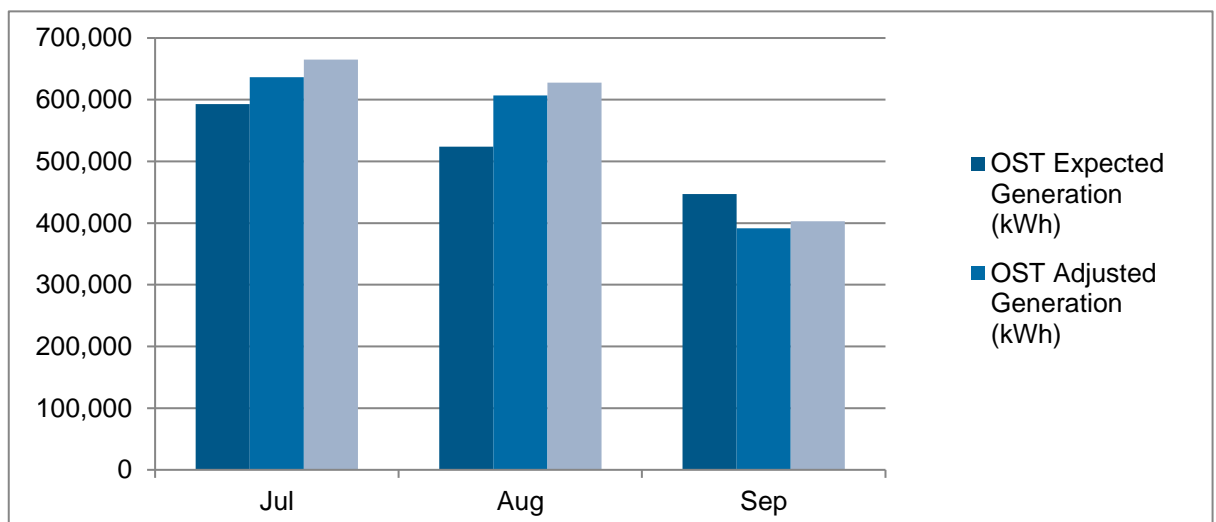
Figure 1, below, compares the expected yield from the original yield study and actual plant generation quarter.

Expected yield is then adjusted with the current irradiation and availability data for the period to show the Adjusted OST expected yield (kWh). Actual generation is taken from the Export Meter readings which have been checked against the total energy output reported by the Skytron monitoring system.

**Table 2: Monthly generation**

Month	OST theoretical expected yield (kWh)	Adjusted OST expected yield (kWh)	Actual generation	Delta actual gen. vs expected gen. (%)	Delta actual gen. vs adjusted gen. (%)
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**Figure 1: Monthly generation**



Generation for July and August was higher than the expected irradiation prediction, reflecting the higher irradiation levels for these months. Despite a lower than expected level of generation in September the overall figure for the period was above expected generation and also above that seen during the same period in 2015

## 2.3 Performance Ratio

There are some concerns as to the consistency of the available data for undertaking the detailed PR for the period. In order not to unduly delay the delivery of this report these calculations and the methodology used to review the data shall be scrutinised and the results submitted as an addendum to this report.

## 2.4 Availability

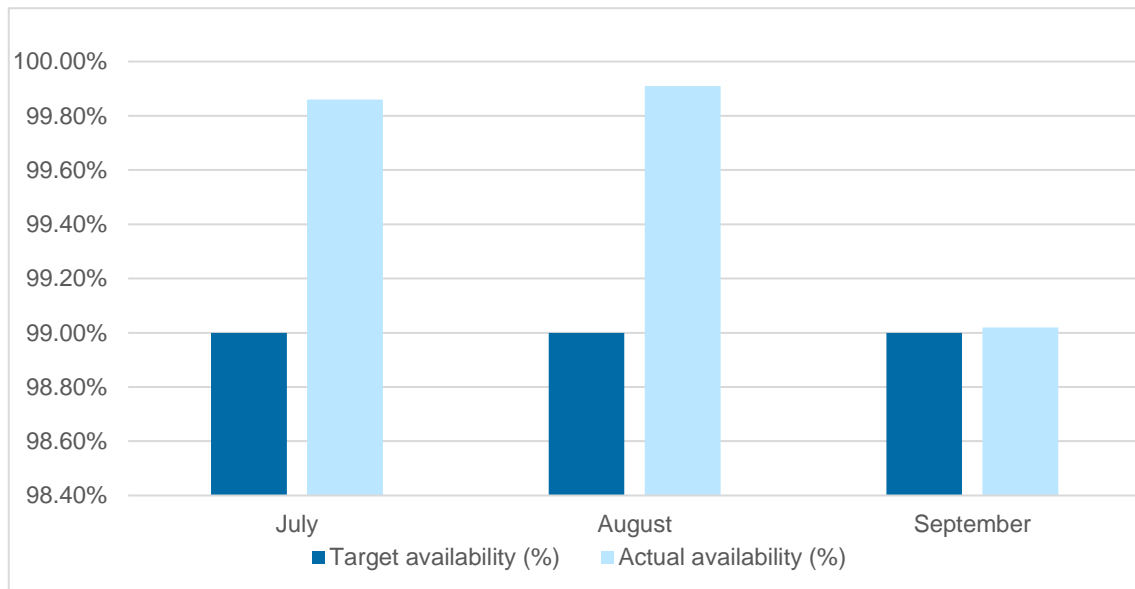
Table 5 below shows the target and actual availability of the plant and the difference between both values for this period.

There have been no significant events reported during the period to impact levels of availability.

**Table 3: Target and actual availability**

Month	Target availability (%)	Actual availability (%)	Difference (%)
July	99.00%	99.86%	0.86%
August	99.00%	99.91%	0.91%
September	99.00%	99.02%	0.02%
<b>Q3 2016 Total</b>	<b>99.00%</b>	<b>99.60%</b>	<b>0.60%</b>
<b>Q3 2015 Total</b>	<b>99.00%</b>	<b>99.50%</b>	<b>0.50%</b>

**Figure 2: Target and actual availability**



Overall availability for the Quarter is reported to be 99.60% which exceeds the target availability of 99%. Each month within the period has exceeded the target availability level.

There is a marginal increase against the same period last year.



### 3 Plant Operations

**Error! Reference source not found.** Summarises the operations and status of recorded operational events that affected the Plant during the period.

**Table 4: Operational events list**

No.	Description	OST Comments	Progress/Status
1	In July a communications problem developed with Inverter 5. This was investigated in August at a routine visit and whilst the string continued to operate, uninterrupted, this issue was resolved at a further site visit in September.	Confirmation from Encome regarding resolution of communication issue outstanding although communications appear to be functional and the remote monitored data is satisfactory.	Ongoing
2	Westmill Co-operative personnel noted that the security system was not alerting the monitoring station	Communication has been made to Westronics and Yeoman Monitoring to resolve this issue and understand why there appears not to have been any alerts notified. This has prompted an investigation to resolve this issue	Ongoing

After several months, the ongoing issue of securing remote communication via the Meter Manager, a communications issue reported in July and investigated in August and confirmed at that time to be a work in progress seems to have been resolved. Clarification is being sought as to the cause and when this was resolved as there is no mention in the September O&M report.

On a number of occasions persons visiting site have noted that there has been no alerts made by the monitoring station of their presence. OST contacted the monitoring stations and the service provider – Westronics – to investigate, identify and resolve the issue. This is yet to be concluded.

No further issues affected the plant during the quarter.

## 4 Operational Activities

### 4.1 Corrective maintenance

OST has reviewed the monthly reports provided by the O&M contractor. One corrective action was required to investigate and resolve communications with Inverter 5, noted in Section 3.

### 4.2 Preventative maintenance

Preventative activities were carried out in accordance with the schedule.

In July the pyranometers were cleaned and an investigation of a communications issue with inverter 5. This fault was identified as a failure within the communications circuit board and has been resolved.

In August the pyranometers were cleaned and orientations checked. All strings were current checked and a visual inspection made of all panels. The CCTV was checked and also the external fencing, all according to the schedule

There were no maintenance activities undertaken during September

The maintenance schedule remains on track.

### 4.3 OST semi-annual site visit

The next scheduled site visit by OST was undertaken on the 12<sup>th</sup> October 2016 when OST personnel were accompanied by a representative from Encome. The report from that site visit has been submitted alongside this report

#### 4.3.1 Module cleaning

From the last quarterly report it was noted that there was a build-up of dirt and residue around the edges of panels and that the last cleaning was undertaken in March 2015. The site visit report for October has reviewed the current condition and whether further cleaning should be planned and the timescale for this.

## 5 Warranties and Service Agreements

OST has been undertaking a task to compile and update a schedule which documents key warranties and service agreements related to key components and services provided to the plant. The purpose of the document is to support regular review and prompt action when services are due for renewal.

A separate report on the expiration of the Inverter warranties was submitted by OST for a previous board meeting and it is now understood that an extended warranty, for the remainder of the plant life is due to be concluded imminently.

Due to the expiration of a number of warranties at the end of July 2016 a review of the spare parts holding is being undertaken by OST in conjunction with Encome to ensure that sufficient stock is available to mitigate most foreseen points of failure and enable availability to be maintained in line with the O&M contract. This is further enhanced and incentivised with the performance bonus. The current O&M provision is contracted until May 2017.

## 6 Annual Performance Premium

The Annual Performance Premium is a bonus which is paid to the O&M contractor in the event that actual yield exceeds the expected yield.

Each Quarter OST reviews the performance of the O&M contractor against the criteria agreed in the O&M Contract and OST provides an analysis of the bonus payable to the O&M contractor to validate the annual bonus payment. The Annual Performance Premium year runs from September 2015 to August 2016.

For this quarter, the bonus has been submitted and verified by OST and subsequently confirmed as £124,369.63. The calculation from Encome is available as a separate document.

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