



Project Title: KXC – R1		Technical Submission No: BAMSE-TSE - 024
Contract No: HLN 0207		
To Daniel Brace- Damien Moran		Company : ARUP
Approval of the following equipment is required:		
Equipment: PV System		
Manufacturer: Enviko		
Description: Supply and install the PV system on the roof of the building		
Specification References: ARUP Stage F Electrical Particular Specification ARUP Stage F Electrical data sheet Y14 Pages 13-17		
Attached Detail Documents:		
Manufactures -Data Sheets on the products		
ARUPS V14 EDS Shhets		
Manufactures company details		
Planned site delivery: January 2018		
Issued by: B Andrews BAMSE Ltd.		Date: 17-06-2016
Please return comments by 21-06-2016 to ensure programmed delivery dates are achieved.		

To be completed and returned by Consultant Design Engineer	
Technical submission is ** approved / approved with comments / not approved. (*delete as appropriate)	
Returned by:	Company:
Signature:	Date:



Solar Photovoltaic System Design & Quotation

for Bam Construction



enviko
renewable energy solutions



Ashley Fromberg

✉ ashley.fromberg@enviko.com

☎ 0208 541 1714



About us

Our expertise has been accumulated through years of practical experience in the renewable energy industry helping to deliver the perfect solution tailored to each individual client's requirements, regardless of application or size. This knowledge allows us to deal with every aspect of a renewable energy project from initial site review, design and planning through to installation, commissioning and on-going monitoring and maintenance of a system.

As part of the UK's government Microgeneration Certification Scheme (MCS) we as accredited installers have an impressive portfolio of solar PV systems throughout the UK, helping each of our clients reduce their carbon footprint whilst also tackling the problems of rising energy costs.

As an independent company we are able to operate with flexibility and autonomy. In doing so we are able to react instantly to the rapidly changing market, offer the latest technologies and always meet the needs of our clients. As partners with the industry's leading manufacturers, you can be assured of only the best products available on the market.





Project Address:	Customer Details:	Enviko References:
Kings Cross AKDN R1		

1. Options and Prices

1. Plot 1 - Supply, Installation, Testing & Commissioning of a 10.6kWp Solar PV System comprising 40 x 265 Wp JA Solar PV modules, Inverter, mounting system, AC/DC cabling and switches, generation meter, and connection to the grid. (not allowing for any DNO Charges)

The price includes supply of the following equipment:

Item Description
Modules – JA Solar 265W
Inverter – SolarEdge
MC4 Female Cable Coupler PV - KBT4 +
MC4 Male Cable Coupler PV - KST4 -
AC Isolator 32A KG32 T203/GBA294 *KL
DC Isolators (4-Pole) KG32 T104/D-P003 KL51V
Cable - DC Armoured 6 mm (per 100m)
Meter – Remote monitoring modem Three ph kWh Meter Elster A100C 1000impkWh
Containment Unit
Meter with Modbus Output
Generation Display Monitor
Roof Fixings - Tric rails and clamps

2. Estimate of performance

The performance of solar PV systems is impossible to predict with certainty due to the variability in the amount of solar radiation (sunlight) from location to location and from year to year. The Government's standard assessment procedure for energy rating of buildings (SAP) states that any system regardless of type will generate 858 kWh/kWp *per annum* minimum and is given as guidance only. We have used the more accurate PVGIS European database which takes into account your exact location, roof orientation & pitch, However this should still not be considered as a guarantee of performance.



Project Address:	Customer Details:	Enviko References:	
Kings Cross AKDN R1	Name: Tom Meredith Tel: (0)17 2789 4386/ Email: tmeredith@bam.co.uk	Date:	16/05/16
		Customer Ref:	Mere_King_AF
		Quotation Ref:	Mere_King_AF 01
		Prepared by:	AF

1. Options and Prices

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Containment Unit
Meter with Modbus Output
Generation Display Monitor
Roof Fixings - Tric rails and clamps

Option Description	Total Price	VAT	Grand Total
		20%	
1. Supply and Installation of 10.6kW solar PV system.	£14,475.00	£2,895.00	£17,370.00

2. Estimate of performance

The performance of solar PV systems is impossible to predict with certainty due to the variability in the amount of solar radiation (sunlight) from location to location and from year to year. The Government's standard assessment procedure for energy rating of buildings (SAP) states that any system regardless of type will generate 858 kWh/kWp *per annum* minimum and is given as guidance only. We have used the more accurate PVGIS European database which takes into account your exact location, roof orientation & pitch, However this should still not be considered as a guarantee of performance.



3. Scope of Contract

Description	Client	Enviko
Consenting Service		
Planning consent variation (if required)		X
Building control approval		X
Application/dialogue with the DNO for G59 grid connection	TBC	
Application and registration for the Feed-In-Tariff	X	X
Design Service		
Confirm structural suitability of roof		X
Structural Survey & design of any upgrade works required to the building to accommodate the solar system	X	
Solar array design		X
Safe access and lifting design		X
Mounting system and fixings		X
AC and DC cabling, switchgear, inverters, G59 relay protection and grid connection design		X
Annual energy yield calculation		X
All relevant design documentation		X
Project schedule		X
Health and safety and CDM compliance		X
Supply, Installation and Commissioning and Handover Service		
Delivery		X
Off loading facilities		X
Secure site storage facilities	X	
Lifting equipment		X
Scaffolding / safe access equipment / edge protection	X	
Supply all necessary hardware for the complete installation of the solar system (including non-solar roofing or other materials where required)		X
Installation of solar system including (but not limited to) fixings, mounting system, panels, DC and AC cabling, inverters, isolators, G59 protection, total generation meter, PV distribution board, connection to the private electrical infrastructure, etc.		X
Ducting, containment, roof entry, water proofing, etc. for all DC cabling from the system to inverters and for all AC cabling from the inverters to the point of connection to the private electrical infrastructure		X
Spare ways in distribution board	X	
MCBs in distribution board or new DB where required		X
Installation of an OFGEM accredited total generation meter with the system		X
Labelling in compliance with MCS and British Standards		X



Description	Client	Enviko
Commission the solar system (including attending a DNO witness test where required)	TBC	
Training on site to the Client in the safe operation of the solar system		X
Revised EPC documentation for the building		X
Handover manual (one electronic and two hard copies)		X
Generalities		
Site rubbish disposal		X
Parking	X	
Secure contract for the FIT total generation tariff	X	X
Inform electricity supplier of installation		X

4. Proposal Clarifications

- Our contract is based on normal and weekend working hours i.e. 0830h – 1630h.
- Clients will sign a contract with Enviko Ltd.
- Our systems are designed to accommodate only minor discrepancies in structural tolerance.
- We have made no allowances for paying any fees, statutory or otherwise.
- Any upgrade of the mains supply is not included.

5. Equipment Supply

Description	Included
PV modules	Yes
Mounting system (frames, rails, brackets, fixings)	Yes
Inverter(s)	Yes
DC & AC isolators	Yes
DC & AC cabling and junction boxes	Yes
DC & AC cabling containment	Yes
EPO and associated containment and wiring	Yes

6. Planning Consent

Before undertaking a micro renewable installation planning permission from the local authority may be required. Some technologies may be classed as permitted development, but clarification should be sought first and confirmation from your local planners that either Planning Permission is not required or that Planning Permission has been granted. It is the view of Enviko that Planning Permission would be permitted under the General Permitted Development Order:

Permitted unless:

- the solar PV or solar thermal equipment would protrude more than 200 millimetres beyond the plane of the wall or the roof slope.



- it would result in the highest part of the solar PV equipment being higher than the highest part of the roof (excluding any chimney);
- the building is within a conservation area or World Heritage Site and the solar PV equipment is installed on a roof which forms the front of the building and is visible from the road or on a wall or roof slope of a building within the curtilage of the dwellinghouse and would be visible from a highway; Now amended to allow developments in conservation area.
- the solar PV equipment would be installed on a building within the curtilage of the dwellinghouse if the dwellinghouse is a listed building.

Conditions:

Development is permitted by Class A subject to the following conditions:

- solar PV equipment installed on a building shall, so far as practicable, be sited so as to minimise its effect on the external appearance of the building;
- shall not run closer than 1 meter to the edge of the roof
- solar PV equipment shall, so far as practicable, be sited so as to minimise its effect on the amenity of the area;
- solar PV equipment no longer needed for microgeneration shall be removed as soon as reasonably practicable.

All issues regarding planning are ultimately the responsibility of the property owner. No responsibility will be taken by Enviko should you wish to proceed with an installation without the correct planning documentation first being in place in the hope of obtaining retrospective permission.

7. Grid Connection

A grid connection application will also need to be submitted to the Distribution Network Operator (DNO) with electrical schematics for the proposed system for anything above 16 amps per phase or 3.68kw for a single phase and 11.04kw for 3phase. An offer must then be obtained from The DNO agreeing to installation or outlining any upgrades to the network that maybe required. Any grid connection upgrade costs are not included in our quotation and will be payable direct to the DNO by the client.

As with the planning process, Enviko will be happy to assist with this if we are appointed as your installer and we will handle the whole process on your behalf without further charge. In the unlikely event that the requisite grid connection capacity is not available to progress this project, we reserve the right to charge a fee of not more than £395 (excl VAT) for the works undertaken by us on your behalf.



8. Building Regulations

The electrical side of the installation is covered by Part P of the Building Regulations. Enviko Ltd. are NAPIT certified and accredited installers under the UK government's Micro-generation Certification Scheme (MCS).

The structural side of Building Regulations (Part A) relates to the weight which is to be added to the roof in comparison to the weight of the roof covering. Following the site survey, we carry out a basic calculation of this ratio to check the system is within the guideline 25%. Included in this quotation is a structural engineers report to confirm suitability.

N.B. Enviko Ltd. will provide advice about installation compliancy, but the onus is on the customer to seek clarification from the relevant authority.

9. General Warranties

Element	Period and Type of Warranty
PV Modules	10-12 Year Warranty on Material and Workmanship. 25 Year Warranty on Performance. Warranties all in line with manufacturer's guidelines.
Inverters	5 Year Warranty (extension available on request)
Labour	2 Year limited Warranty.
Complete System	2 Year Turnkey Warranty, covering the elements stated in the table

10. Elements covered Turnkey Warranty

Element	Included
System becomes inoperable as a result of defects in material or workmanship	Included
Defective installation (not included in supply-only)	Included
Labour cost	Included
Damage caused by electrical surges, lightning, fire, flood, pest damage, accidental breakage, actions of third parties and other events or accidents outside reasonable control and not arising under normal operating conditions.	Not Covered

Solis Three Phase Inverter



Leading Features

- ▶ Three phase output
- ▶ Over 97.5% Max. efficiency
- ▶ 200V – 800V input voltage range
- ▶ Dual MPPT design with precise MPPT algorithm
- ▶ Compact and light design for one-person easy installation
- ▶ IP65, visually pleasing for domestic environment
- ▶ RS 485, WiFi/GPRS (optional) interface
- ▶ Numerous protection functions
- ▶ WiFi and monitoring app available
- ▶ 5 years standard warranty, 10 years optional upgrade

Address: No. 57 Jintong Road, Binhai Industrial Park, Xiangshan, Ningbo, Zhejiang, 315712, China

Tel: +44 (0)113 328 0870 +86 (0)574 6578 1806 **Fax:** +86 (0)574 6578 1606

Email: info@ginlong.com **Web:** www.ginlong.com



Datasheet

Model	Solis-6K	Solis-10K	Solis-15K
Energy source		PV	
Input Side			
Max. DC input voltage(V)		1000	
Start-up DC input voltage(V)		330	
MPPT operating range(V)	200-800		
Rated DC voltage(V)		400	600
Max. DC input current(A)		15+15	18+18
Number of MPP/Max strings per MPPT		2/2	
Output Side			
Rated output power(kW)	6	10	15
Max. transient power(kW)	6.6	11	15
Rated AC grid voltage(V)		380/400/480	
AC grid voltage range(V)		313-470(adjustable)	
Operating phase		three	
Rated AC grid output current(A)	9.1/8.7/7.2	15.2/14.5/12.0	22.8/21.7/18.0
Max. AC output current(A)	10.5/10.0/7.9	16.7/16.0/13.2	25.1/23.1/19.8
Output power factor		>0.99	
Grid current THD		Total THD<4%	
DC injection current(mA)		<20	<50
Rated grid frequency(Hz)		50/60	
Efficiency			
Max. efficiency		>97.5%	
Euro efficiency		>96.5%	
MPPT efficiency		>99.9%	
Protection			
Temperature protection		Yes	
DC reverse-polarity protection		Yes	
AC short circuit protection		Yes	
AC output overcurrent protection		Yes	
Output overvoltage protection-Varistor		Yes	
Ground fault monitoring		Yes	
Grid monitoring		Yes	
Islanding protection		Yes	
Integrated DC switch		Optional	
General data			
Size(mm)		430W*600H*220D	
Weight(kG)	27.0		30.0
Topology		Transformerless	
Internal consumption		<1W (Night)	
Running temperature		-25°C~60°C	
Ingress protection		IP65	
Operating range utility frequency (Hz)		47-52 or 57-62(adjustable)	
Noise emission(typical)		<30 dBA	
Cooling concept	Natural convection		Forced air cooling
Max.operating altitude without derating		2000m	
Designed lifetime		>20 years	
Utility monitoring	Islanding protection V _{ac} F _{ac} in accordance with UL 1741, G59/2, AS4777, VDE 0126-1-1		
Operating surroundings humidity		0~95%	
EMC	EN61000-6-1:2007	EN61000-6-3:2007	
Features			
DC Connection		MC-4 mateable	
AC Connection		IP67 rated plug	
Display		LCD, 2 x 20 Z.	
Interface		RS 485, WiFi/GPRS (optional)	
Warranty		5~10 Years	

JAP6

60/245-265/3BB

MULTICRYSTALLINE SILICON MODULE



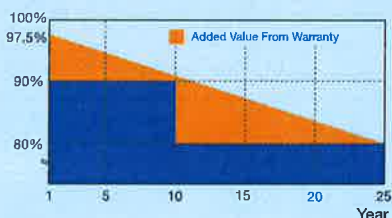
JA Solar Holdings Co., Ltd.

JA Solar Holdings Co., Ltd. is a world-leading manufacturer of high-performance photovoltaic products that convert sunlight into electricity for residential, commercial, and utility-scale power generation. The company was founded on May 18, 2005, and was publicly listed on NASDAQ on February 7, 2007. JA Solar is one of the world's largest producers of solar cells and modules. Its standard and high-efficiency product offerings are among the most powerful and cost-effective in the industry.

A d d : NO.36, Jiang Chang San Road, Zhabei, Shanghai 200436, China
T e l : +86 21 6095 5888 / +86 21 6095 5999
F a x : +86 21 6095 5858 / +86 21 6095 5959
Email: sales@jasolar.com market@jasolar.com

Superior Warranty

- 10-year product warranty
- 25-year linear power output warranty



Key Features



Multicrystalline modules designed for residential commercial and utility applications, rooftop or ground mount



High output, 16.21% highest conversion efficiency



Designed for UL DC 1000V applications



Anti-reflective and anti-soiling surface reduces power loss from dirt and dust



Outstanding performance in low-light irradiance environments



Excellent anti-fire performance passed the latest UL1703 fire test



High salt and ammonia resistance certified by TÜV NORD

Reliable Quality

- Positive power tolerance: 0~+5W
- 100% EL double-inspection ensures modules are defects free
- Modules binned by current to improve system performance
- Potential Induced Degradation (PID) Resistant

Comprehensive Certificates

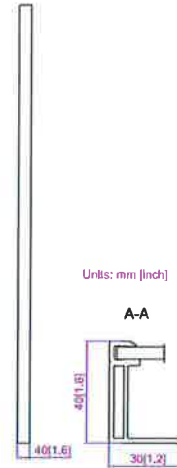
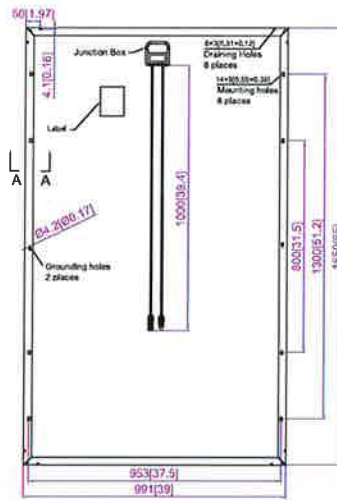
- IEC 61215, IEC 61730, UL1703, CEC Listed, MCS and CE
- ISO 9001: 2008: Quality management systems
- ISO 14001: 2004: Environmental management systems
- BS OHSAS 18001: 2007: Occupational health and safety management systems
- Environmental policy: The first solar company in China to complete Intertek's carbon footprint evaluation program and receive green leaf mark verification for our products



Specifications subject to technical changes and tests. JA Solar reserves the right of final interpretation.

JAP6 60/245-265/3BB

Engineering Drawings

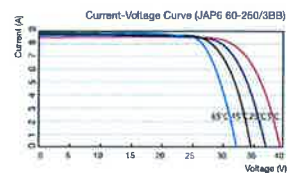
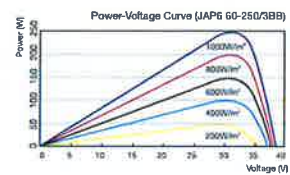
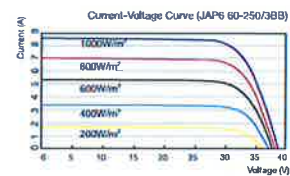


MECHANICAL PARAMETERS	
Cell (mm)	Poly 156x156
Weight (kg)	18.2 (approx)
Dimensions (LxWxH) (mm)	1650x991x40
Cable Cross Section Size (mm ²)	4
No. of Cells and Connections	60 (6x10)
Junction Box	IP67, 3 diodes
Connector	MC4 compatible/Amphenol H4
Packaging Configuration	26 Per Pallet

WORKING CONDITIONS	
Maximum System Voltage	DC 1000V (UL)
Operating Temperature	-40°C ~ +85°C
Maximum Series Fuse	15A
Maximum Static Load, Front (e.g., snow and wind)	5400Pa (112 lb/ft ²)
Maximum Static Load, Back (e.g., wind)	2400Pa (50 lb/ft ²)
NOCT	45±2°C
Fire Performance	Type 1
Application Class	Class A

TYPE	ELECTRICAL PARAMETERS				
	JAP6 60-245/3BB	JAP6 60-250/3BB	JAP6 60-255/3BB	JAP6 60-260/3BB	JAP6 60-265/3BB
Rated Maximum Power at STC (W)	245	250	255	260	265
Open Circuit Voltage (Voc/V)	37.50	37.66	37.82	37.98	38.14
Maximum Power Voltage (Vmp/V)	29.59	29.94	30.29	30.63	30.96
Short Circuit Current (Isc/A)	8.86	8.92	8.98	9.04	9.10
Maximum Power Current (Imp/A)	8.28	8.35	8.42	8.49	8.56
Module Efficiency [%]	14.98	15.29	15.59	15.90	16.21
Power Tolerance (W)	-0~+5W				
Temperature Coefficient of Isc (αIsc)	+0.058%/°C				
Temperature Coefficient of Voc (βVoc)	-0.330%/°C				
Temperature Coefficient of Pmax (γPmp)	-0.410%/°C				
STC	Irradiance 1000W/m ² , Cell Temperature 25°C, Air Mass 1.5				

I-V CURVE



TYPE	NOCT				
	JAP6 60-245/3BB	JAP6 60-250/3BB	JAP6 60-255/3BB	JAP6 60-260/3BB	JAP6 60-265/3BB
Max Power (Pmax) [W]	177.87	181.50	185.13	188.76	192.39
Open Circuit Voltage (Voc) [V]	34.48	34.61	34.68	34.76	34.87
Max Power Voltage (Vmp) [V]	27.20	27.42	27.71	28.05	28.42
Short Circuit Current (Isc) [A]	7.03	7.13	7.18	7.21	7.24
Max Power Current (Imp) [A]	6.54	6.62	6.68	6.73	6.77
Condition	Under Normal Operating Cell Temperature, Irradiance of 800 W/m ² , spectrum AM 1.5, ambient temperature 20°C, wind speed 1 m/s				

Electrical data in this catalog do not refer to a single module and they are not part of the offer. They only serve for comparison among different module types.

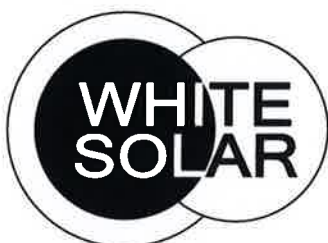


keeping you in touch
with your energy



- AnyNet embedded SIM
- Battery Back-up
- Choice of external aerials
- Half Hourly transmission over GPRS
- Low cost data packets
- Web portal for checking meter data
- Customised client pages

- A range of modular enclosures built to your specification.
- AC Lockable Isolators, MCB, RCD or RCBO can be incorporated.
- Pre-Wired and tested, plug and play.
- SIM is ready to go.
- PV Installations, Electricity meters, Gas meters, Water meters, can all be read by the Modem.
- Fast turn around of built units.



White Solar Systems Ltd
42-46 Broton Drive
Broton Trading estate
Halstead
essex
CO9 1HB

Tel: 020 8807 4621
Fax: 020 8884 1865
email: david@whitesolar.co.uk

www.whitesolar.co.uk
www.emig.co.uk

Job Title: Aga Khan Building - Kings Cross P1 Date: 12 Feb 18
 Job Number: 216667 Purpose of Issue: Stage F Revision: F1

General Data

Reference	PV-01	Model reference	JAP6 60 245-285 3BB
Location	Building roof level	Manufacturer	J A Solar
Application	Grid connected	Telephone number	
		Fax number	
		Address	
Associated drawings	Electrical schematic		
	Roof small power layout		

This data sheet specifies the materials and workmanship requirements for electrical aspects of PV modules and their installation. It does not cover all the requirements of Building Integrated PV modules. Additional requirements are given in:

Electrical schematic - KXC-R1-001-ARP-XX-XX-DR-E-05010
 KXC-R1-001-ARP-XX-RF-DR-E-04110

PV Technology

	Required	Offered	
PV Technology	Polycrystalline	Polycrystalline	
Encapsulation method			
Warranted life	25	25	Years
Building integration method			
PV/Thermal Collector	No	NO	

System Performance

	Required	Offered	
Required output	7500	9045	kWh/year
Array area available	60		m ² Refer to: KXC-R1-001-ARP-XX-RF-DR-E-04110
Shading of cells	None		Refer to:

	Required	Offered
System connection	Grid connected	GRID CONNECTED
Appearance	Standard	STANDARD
Orientation	18° from South	19° from South
Tilt	10°	10°

The Contractor shall include with their submission, justification of the energy yield declared. This should include details

Job Title: Aga Khan Building Kings Cross R1
 Job Number: 216667 Purpose of Issue: Stage F
 Date: 12 Feb 16
 Revision: F1

PV Module - Electrical Data *See Datasheet*

	Required	Offered		Required	Offered
Peak Power at STC	265	265	Wp	Rated output	265
Voltage at Pmax	30.96		V dc		

Inverter Details *see Datasheet*

	Required	Offered
Inverter / Power Conditioning Unit	Supplier to propose	
Inverter Output Voltage	230	
Phases	1	
Frequency	50	

Electrical Protection

The requirements given here are intended to clarify the protection requirements of the installation and shall be read in conjunction with the Electrical Schematic and Engineering Recommendations G59 and G83 as appropriate.

	Required	Offered
Overcurrent protection	mcb	MCB
Earth fault protection	mcb	MCB
Synchronising	Automatic	AUTO MATIC
Overvoltage setting	+10% phase-neutral	+10 phase-neutral
Undervoltage setting	-10% phase-neutral	-10 phase-neutral
Overfrequency setting	+1%	+1%
Undervoltage setting	-6%	-6%
Loss of mains protection	ROCOF (frequency shift)	ROCOF
Reverse power	Yes	Yes
Method of preventing dc entering ac network	Isolation transformer	Inverter Transformer - Electronic RCD protection
Disconnection	By separation of mechanical contacts. Electronic disconnection not permitted.	✓
Tripping times	<0.5secs	50.5 SECS
No reconnection for	5 secs	50.5 SECS - minimum 20 SECS

Job Title: Aga Khan Building - Kings Cross R1	Date: 12 Feb-16
Job Number: 216667	Revision: F1
Purpose of Issue: Stage F	
Lockable isolator - ac side of inverter	Yes
Lockable isolator - dc side of inverter	Yes
Earthing	TN C-S system → ✓

Job Title: Aga Khan Building - Kings Cross P1 Date: 12 Feb 16
 Job Number: 216867 Purpose of Issue: Stage F Revision: F1

Fault level from network	Required	Offered	kA	Metering	Required	Offered
	10				MID	MID

DND - 0 clarify

Protection systems are to be fully tested and commissioned. For grid connected systems this shall be carried out with a representative of the DNO in attendance.

Load schedule (for off-grid systems)

Ref.	Description	Duration	Electrical Load				Load in VA or Watts	
			Qty	VA	Watts	P.F.	Total VA	Total Watts
	N/A							
Total								

Standards

PV modules shall comply with the following standards where applicable:

PV modules

The film types

IEC 61646

Crystalline types

IEC 61215

Electrical

General electrical installation

BS7671 & IEC 60364

Installations connected to the distribution network

Embedded installations to 5MW

Engineering Recommendation G59/4

Embedded installations to 16A/phase

Engineering Recommendation G83/1

Connection agreement

Contractor to liaise & coordinate for connection agreement with PES/DNO

Safety

Health & Safety

CDM Regulations and Health & Safety at Work Act

Live Working

Avoid live working. If essential, follow HSE Guide 85

Monitoring & Display

Purpose	Required	Offered
	Energy management panel	<i>Energy management panel</i>
Style		<i>see emig DataSheet</i>