**PQS Quality Assurance Protocol**

WHO/PQS/E001/PVAC-VP.2
Original: English
Distribution: General

**TITLE: Solar power system for cold and freezer rooms.**

| | |
|---|---|
| *Product verification protocol:* | E001/PVAC 01-VP.2 |
| *Applies to specification ref(s):* | E001/PVAC 01 |
| *Date of origin:* | 17 February 2020 |
| *Date of last revision:* | New |

**Contents**



## 1. Scope

Public sector consultations and reports from the field have identified the need for solar power systems for walk-in cold rooms and walk-in freezer rooms.

This specification describes the requirements for a generic hybrid solar power system generating electricity (single or three-phase alternating current (AC) electricity) with a photovoltaic (PV) solar array and additional source of back-up power for cold rooms (CR) or freezer rooms (FR) that comply with **WHO PQS E001/CR-FR01** specifications. It also describes the installation and maintenance advisory services that all legal manufacturers must offer in order to become a prequalified supplier of CR-FR hybrid solar power systems.

Historically, CR and FR operate with electric vapor compression refrigeration which is powered with single or three-phase alternating current (AC) electricity supplied by an electric grid (mains). This power supply is typically backed-up by a fuel-fired generator that is capable of providing 100% of the CR-FR electrical requirements.

The hybrid solar power system must be capable of providing 100% of the site-specific CR-FR electrical requirements, both as a hybrid solar power system with back-up power and as a standalone solar power system operating with no back-up power system. Typically, hybrid solar power systems will require a solar array, battery, battery charge control, over current protection devices, a DC to AC inverter and a back-up power system capable of also providing 100% of the CR-FR electrical requirements including battery recharging.

If an unreliable electrical grid (mains power with history of frequent and/or prolonged power outages) is available and, if allowed by the local electrical supply authority, a grid-connected solar power system can be used to import power for battery chargers and the CR-FR load. An unreliable grid connection will not, however, be considered a back-up power system. In such cases, the hybrid solar power system would require 100% solar power capability, 100% back-up power capability (e.g. with generators) and have capability to utilize the grid connection.

Grid-tied solar power systems that are synchronized to export power to a reliable grid (mains), direct current (DC) -only solar power systems and solar direct drive CR-FR are not included this specification.

The following documents are associated with this specification:

- **E001/PVAC-VP1** is a type-examination protocol which will be used for prequalification evaluations.
- **E001/PVAC-VP2** is completed by an employer or his QA assessor and sets out the requirements for a specific installation. The document also specifies the installation, commissioning and handover procedure. The completed protocol should be read in conjunction with **E001/PVAC 01**, to which it refers.

**E001/PVAC 01** and a completed **E001/PVAC 01-VP2**, together with an employer's other documents, are intended to form the basis for a contractual agreement between the employer and the legal manufacturer or reseller for the supply of the components required for a specific installation. This also forms the basis for a contractual agreement between the employer and the approved installer.

## 2. Terms and definitions

Note: Solar energy definitions are contained in **IEC 61194**.

Alternating current (AC): an electric current that reverses its direction at regularly recurring intervals whose value varies as a sine wave.
Autonomy: time in days that a solar power system can maintain the vaccine load within the acceptable temperature range under low solar radiation conditions (e.g. rain). Autonomy is determined as described in Clause 4.2.3 Battery set sizing.
Back-up power: a secondary, auxiliary power source (e.g. generator) capable of independently powering 100% of all CR-FR electrical needs and battery recharging.
Design day: for purposes of sizing the solar power system, the design day requires the largest of the following three options for sizing the solar array to meet all CR-FR electrical load requirements: 1) based on the lowest monthly solar radiation reference period; 2) based on the highest average daily electrical load requirement for a given month; or 3) both simultaneously.
Direct current (DC): an electric current flowing in one direction.
Employer: the organization that contracts with the legal manufacturer or reseller who will supply the system components and the installation and maintenance advisory services described in this specification. The employer will typically contract with an installer who will install and commission the installation under the supervision of a QA assessor and also with a maintenance contractor who will maintain the installation.
Grid-connected: solar power system that imports electricity from a power grid (mains).
Grid-tied: grid-connected solar power system that also is synchronized to export electricity into a power grid (mains).
Hybrid solar power system: solar power system with one or more auxiliary sources of power (e.g. a diesel or petrol-fueled stand-by generator).
In writing: communication by letter, fax or email.
Installation: the complete hybrid solar power system installation described in this specification and in the companion **E001/PVAC01-VP2** document, together with any other employer's requirements documentation issued for a specific installation or installations including voltage stabilizers and standby generators where these are listed in the employer's requirements.
Installer: a person or organization who has been appointed by the employer to carry out the installation of the system. A qualified installer may be either a legal manufacturer or a reseller or an approved representative and must:

- supply a coherent, correctly sized installation where the settings of all the components have been adjusted for optimum performance at the installation site,
- have installed and supported (e.g. by providing on-going technical assistance, spare parts and system documents) at least five hybrid photovoltaic systems in a developing country or countries for at least two years (detailed references, including donors, locations and contacts, must be provided for independent verification),
- have the capacity and financial resources to provide long-term support to the systems in the country of destination.

Inverter: electronic component to convert DC to AC electricity.

Legal manufacturer: the natural or legal person with responsibility for the design, manufacture or integration of components, packaging and labeling of a product or device before it is placed on the market under their own name, regardless of whether these operations are carried out by that person themselves or on their behalf by a third party.
Maintenance contractor: a person or organization contracted by the employer to maintain the installation.
Maximum power point tracking (MPPT) control: a type of photovoltaic-to-battery charge control that optimizes solar array output by operating as a DC to DC converter. It uses the DC input from the PV array and converts it back to a different DC voltage and current output so that the PV module is correctly matched to the battery. This allows a solar array to be wired at optimal voltage to overcome long cable distances that otherwise would result in excessive voltage drop or unacceptably large cable diameter.
Montreal Protocol: Montreal Protocol on Substances that Deplete the Ozone Layer.
QA assessor: the person or organization appointed by the employer to assess the suitability of candidate installers, to evaluate their proposals and to monitor the assembly and commissioning of the installation on site.
QA: quality assurance.
Region: a contiguous geographical area within which the legal manufacturer or reseller is able to provide the full range of services described in this specification.
Reseller: a commercial entity, licensed to act on behalf of a legal manufacturer, and which carries product liability and warranty responsibilities no less onerous than those carried by the legal manufacturer.
Solar radiation reference period: the minimum average daily solar radiation on the plane of the solar array that is required to properly power the CR-FR, expressed in kWh/m²/day.
Standalone: solar power system capable of independently powering 100% of all CR-FR electrical needs. It is the primary source of power for the CR-FR and can be coupled to a back-up power source (generator) to also operate as a hybrid solar power system.
User: the person responsible for the day to day operation and temperature monitoring of the (CR-FR) room and/or solar power system.

## 3. Normative references

*(Use most current version)*

BS EN 60529:1992+A2:2013: Degrees of Protection by Enclosures (IP Code)
EMAS: European Union Eco-Management and Audit Scheme.
IEC 60335-1: 2006 Household and similar electrical appliances - Safety - Part 1: General requirements.
IEC 60364-1: 2005 Low-voltage electrical installations - Part 1: Fundamental principles, assessment of general characteristics, definitions.
IEC 61000-6-1 edition 2.0: 2005 Electromagnetic compatibility (EMC) Generic standards - Immunity for residential, commercial and light-industrial environments.
IEC 61000-6-3 edition 2.1: 2011 Electromagnetic compatibility (EMC) Generic

standards - Emission standard for residential, commercial and light-industrial environments.
IEC 61194: 1992 Characteristic parameters of stand-alone photovoltaic (PV) systems.
IEC 61215: 2005 Crystalline silicon terrestrial photovoltaic (PV) modules - Design qualification and type approval.
IEC 61646: 2008 Thin film terrestrial photovoltaic (PV) modules – Design qualification and type approval.
IEC 62109-1 Safety of power converters for use in photovoltaic power systems – Part 1: General requirements.
IEC 62109-2 Safety of power converters for use in photovoltaic power systems – Part 2: Particular requirements for inverters.
IEC TS 62804-1:2015 Photovoltaic (PV) modules – Test methods for the detection of potential-induced degradation – Part 1: Crystalline silicon.
IEEE 937: Recommended Practice for Installation and Maintenance of Lead-Acid Batteries for Photovoltaic (PV) Systems.
IEEE 1562: 2007 Guide for Array and Battery Sizing in Stand-Alone Photovoltaic (PV) Systems.
ISO 1461: 2009 Hot dip galvanized coatings on iron and steel articles - specifications and test methods.
ISO 9001: Quality Management Systems – Requirements.
ISO 14001: 2004 Environmental management systems - Requirements with guidance for use.
ISO 20282-1: 2006 Ease of operation of everyday products - Part 1: Context of use and user characteristics.
Solar Autonomy Calculation Tool, H.Toma and T. Markvart, University of Southampton, UK 2009.
WHO PQS E001/CR-FR01.4: Cold rooms and freezer rooms.
WHO PQS E001/PVAC 01: Solar power system for cold and freezer rooms.
WHO PQS E001/PVAC 01-VP.2: Quality Assurance Protocol.

## 4. Applicability

The Annex 1 specification checklist will be completed by the employer.

The Annex 2 QA assessment will be completed by the installer.

The Annex 3 checklist will be completed by the user.

## 5. Specification checklist

### 5.1 Specification requirements

Annex 1 lists the required installation(s) and their location(s). Each complete installation (including hybrid solar power system, back-up power system and PQS complying CR-FR) is to be designed and supplied using component elements already prequalified by WHO in accordance with PQS specifications **E001/CR-FR** and **E001/PVAC 01**. Legal manufacturers and resellers are required to consider environmental conditions at the installation site(s) when selecting a suitable component – for example, in dusty conditions, avoid using components requiring frequent cleaning maintenance.

Equipment for known locations is to be designed for climatic conditions at, or as close as possible to, the named site. Equipment for unknown locations is to be designed on the basis of the best available climatic information for the country, region, province or district specified in Annex 1, Part 1, line 1.1.

### 5.2 Criteria for qualification

An individual installation will be accepted by the employer when:

- The completed Annex 2 handover checklist shows that all components are correctly installed and are operating satisfactorily.
- A completed Annex 3 user checklist has been received, showing no faults and correct operation throughout the first 30 days of operation.

## 6. Quality control checklist

### 6.1 Quality control standards

All installation work must be carried out in accordance with the legal manufacturer's installation instructions. All on-site electrical installation work must comply with **IEC 60364-1** and applicable national/local codes.

### 6.2 Manufacturing quality control checklist

On-site inspection of the production facility is not required.

### 6.3 Site work quality control checklist

The installer will carry out an inspection of each completed installation and complete a copy of the Annex 2 checklist. If the installation is satisfactory it will be handed over to the user who will complete a copy of the Annex 3 checklist after the first 30 days of operation. The employer will only accept the installation when both checklists are satisfactory.

#### *6.3.1 Training*

User training is optional. If offered, the syllabus should cover the following topics:

- operations,
- daily, weekly and monthly maintenance tasks,
- health and safety guidance,
- basic troubleshooting
- decommissioning.

6.4 Handover dossier

The handover dossier must be issued to the employer after the installation has been completed. The dossier must be presented in a lever arch folder with clearly marked subject dividers and must contain the following:

- completed, signed, installation checklist,
- user manual, installer (technician) manual and installation instructions for the hybrid solar power system containing the material listed in specification **E001/PVAC**,
- completed, signed, 30-day test checklist.

One copy of the user manual is also to be handed to the responsible person at the installation site.

## 7. Customer reference checklist

Not applicable.

## 8. Prequalification evaluation

Not applicable.

## 9. Modified products

Not applicable.

## Annex 1 – Specification checklist[1]

Notes:

- The employer should complete one checklist for each **known** site (Part 3).
- For **unknown** sites, complete one checklist (Part 4) for each type and size of hybrid solar power system. Technical assistance may be required to estimate electrical load, design day load and hybrid solar power system requirements.

| **Hybrid solar power system spec checklist** | | **Date:** | |
|---|---|---|---|
| **Country:** | | | |
| Procurement agency:<br>Contact name:<br>Address 1:<br>Address 2:<br>Address 3:<br>Address 4:<br>Tel:<br>Fax:<br>Email: | | | |
| All system components must comply with applicable PQS specifications. The cold room or freezer room must be prequalified to applicable PQS specification **E001/CR-FR**. Solar power systems must comply with PQS specification **E001/PVAC.** | | | |
| **PART 1: Site information** | | | |
| 1.1 | **Site location and Quantity**<br>*The solar power system for equipment on unknown sites will be a generic design.* | **Known** (complete Part 2 and Part 3 only) **Qty =**<br>**Unknown** (complete Part 2 and Part 4 only) **Qty =** | |
| | | | |
| **PART 2: Load details** | | | |
| 2.1 | **Cold or freezer room** | Manufacturer/model: | |
| 2.2 | **Design day load(s)**<br>*manufacturer, model and electrical data (e.g. voltage, frequency, single or three phase, quantity, Watts, hours per average day and design day Watt hours/day).*<br>*Expand list as necessary.* | **Load 1**: CR or FR, Design day Watt hours/day<br>**Load 2:** | |
| 2.3 | **Temperature zone**<br>*Choose the appropriate temperature zone. If winter temperatures are low and site* | Hot zone (+43°C):<br>Temperate zone (+32°C):<br>Moderate zone (+27°C):<br>Cold climate: | Yes No |

[1] This is a Word 'Form' document. It needs to be copied before it can be used for data entry. Then activate View/Toolbars/Forms and click the 'lock' icon on the Forms toolbar. See also Word Help.

| Hybrid solar power system spec checklist | | Date: | |
|---|---|---|---|
| **Country:** | | | |
| | *heating is unreliable, battery capacity may be reduced.* | If YES, specify the lowest winter temperature that the load/battery will be exposed to[2]: | °C |
| **PART 3: Known sites** | | | |
| 3.1 | **Known site location details**<br>*Fields marked * are mandatory. The more precise the other data, the easier it will be to design the solar power system to suit the specific site.* | * Country: | |
| | | * Longitude: | |
| | | * Latitude: | |
| | | Nearest city/town: | |
| | | Village or suburb: | |
| | | Site name: | |
| | | Altitude in metres above sea level: | |
| 3.2 | **Array support details**<br>*The chosen array position must be oriented as close as possible to South (northern hemisphere) or North (southern hemisphere) and must be completely shade free (including overhead cables) from at least 9:00am to 3:00pm throughout the year. Give orientation in Northern hemisphere as: SE, SSE, S, SSW, SW or in Southern hemisphere as: NE, NNE, N, NNW or NW.* | **Pitched roof mounting?** | Yes No |
| | | If YES, give roof pitch in degrees: | |
| | | If YES give roof slope orientation: | |
| | | If YES, state roof structure and finish materials: | |
| | | If YES, height of building to eaves: | m |
| | | **Flat roof mounting?** | Yes No |
| | | If YES, height of building to roof: | m |
| | | If YES, state roof finish material: | |
| | | **Wall mounting?** | Yes No |
| | | If YES, give wall orientation: | |
| | | If YES, give mounting height: | m |
| | | **Ground mounting:** | Yes No |
| | | **Pole mounting:** | Yes No |
| | | If YES, give height of pole: | m |
| | | If YES, choose top or side mount: | Top Side |
| 3.3 | **Array cable**<br>*Measure the true distance[3] from the array to the load or battery set position as accurately as possible.* | Length of array cable required: | m |
| | | Measured cable length including all bends, and vertical and horizontal lengths, plus 10%. | m |
| | **Array cable positioning** | In free air, underground | |
| 3.4 | **Battery location/notes:** | | |
| 3.5 | **Charge control location/notes** | | |
| 3.6 | **Inverter location/notes:** | | |
| 3.7 | **Generator location/notes:** | | |
| **PART 4: Unknown sites** | | | |
| 4.1 | **Unknown site location details**<br>*Field marked * is mandatory. Give as much additional detail as possible.* | * Country: | |
| | | Region(s) or Province(s) (if known): | |
| | | District(s) (if known): | |
| 4.2 | **Solar power system quantity** | Solar array units required: | |

[2] This is the lowest temperature in the room housing the load battery, NOT the lowest outside air temperature. In cold climates, temperatures down to -10°C may occur in health facilities that are left unattended and unheated for long periods.

[3] True distance is measured along the actual route the cable will follow. Measure vertically, horizontally and with all changes in direction at 90 degrees.

| Hybrid solar power system spec checklist | | Date: | |
|---|---|---|---|
| **Country:** | | | |
| 4.3 | **Array support details** | No. of roof/ground mounting kits: | |
| | | No. of pitched roof mounting kits: | |
| | | No. of pole mounting kits: | |
| | | No. of wall mounting kits: | |
| | | No. of ground mounting kits: | |
| 4.4 | **Array cables**<br>*Agree realistic lengths with the Legal manufacturer or reseller.* | Typical length of array cable: | m |

## Annex 2 – Installation checklist

Note: The installer must fill in this checklist for each completed installation.

| **Solar power system installation checklist** | | | **Date:** | |
|---|---|---|---|---|
| **Country:** | **City/town:** | | **Site name:** | |
| Installation company:<br>Installation technician:<br>Address 1:<br>Address 2:<br>Address 3:<br>Address 4:<br>Tel:<br>Fax:<br>Email: | | | | |
| *Note: All checks must be satisfactory before the installation is handed over to the user.* | | | | |
| **CHECK 1 – Hybrid power system description** | | | | |
| 1.1 | Supplier- Legal Manufacturer or Reseller: | Name: | | |
| 1.2 | Solar module: | Mfc./Model: | Qty: | |
| 1.2 | Solar module rating (stc): | Voc: | Isc: | |
| 1.3 | Solar array: | Watts peak (STC): | Voc: | |
| 1.3 | Solar array configuration: | *(e.g. 36 modules / 3 series x 12 parallel)* | | |
| 1.4 | Solar array structure: | Type of support structure (describe): | | |
| 1.5 | Battery system: | Mfc/Model: | Qty: | |
| | Battery rating (C/72 to 1.75 vpc at +25°C) | Battery voltage (nominal):<br>Battery amp hours: | | |
| | Type/quantity/wiring configuration (e.g. VELA / 48 cells / 24 series x 2 parallel)<br><br>Battery location: | | | |
| 1.6 | Battery charge control(s): | Mfc/Model: | Qty: | |
| | Control type / ratings: | MPPT, PWM , other: | Vdc in Amps | |
| | Control features: | Battery capacity indicator _____<br>Battery voltage meter _____<br>Generator control interface_____ | Control set points (list) | |
| 1.7 | Inverter(s): | Mfc/Model: | Qty: | |
| | Inverter type / ratings: | Wave form: | Watts (continuous) Watts (30 minutes) | |
| | Inverter features: | Inverter input/output volts: | Other: | |
| | Inverter location: | | Cable- battery (m) | |
| 1.8 | Generator: | Mfc/Model: | Qty: | |
| | Generator ratings: | Prime/continuous/other: | KW (continuous) __<br>Fuel storage (days)_ | |
| | Generator control: | Mfc/Model: | Ratings:<br>Settings: | |
| | Battery charger: | Mfc/Model: | Ratings:<br>Settings: | |

| Solar power system installation checklist | | | Date: | |
|---|---|---|---|---|
| **Country:** | **City/town:** | | **Site name:** | |
| | | | | |
| 2.1 | Was the shipment damaged? | | | Yes No |
| | If YES, describe damage: | | | |
| 2.2 | Were any components missing? | | | Yes No |
| | If YES, list missing parts: | | | |
| 2.3 | Were any components under-supplied? | | | Yes No |
| | If YES, list under-supplied parts: | | | |
| 2.4 | Were any spare parts missing? | | | Yes No |
| | If YES, list missing parts: | | | |
| 2.5 | Were any spare parts under-supplied? | | | Yes No |
| | If YES, list under-supplied parts: | | | |
| 2.6 | Have damaged/missing/under-supplied parts been replaced? | | Not applicable | Yes No |
| | If NO, describe action taken to complete the installation: | | | |
| | *Comments:* | | | |
| **CHECK 3 – Power systems (for back-up power generator refer to generator manufacturer's instructions):** | | | | |
| 3.1 | Back-up generator | Transfer switching: Automatic Manual Both | | |
| 3.2 | Solar array tilt/orientation (measure angle relative to the horizontal and measure compass orientation): | | | / degrees |
| 3.3 | Do shadows fall on the solar array between 9:00am and 3:00pm? | | | Yes No |
| | → *If YES, the system may fail and the array may need to be moved.* | | | |
| 3.4 | Array support structure: | Anodized aluminium: | | Yes No |
| | | Stainless steel: | | Yes No |
| | | Galvanized steel (painted or unpainted): | | Yes No |
| | | Other (material (describe): | | |
| | → *If 'other material', the structure does not comply and must be replaced.* | | | |
| | Are solar array maintenance tools/supplies provided? | | | Yes No |
| | Have theft-deterrent fasteners been used for all accessible fasteners? → *If no, fasteners do not comply and must be replaced.* | | | Yes No |
| 3.5 | Lightning protection and grounding: | | | |
| | Has the lightning protection circuit been correctly fitted? | | | Yes No |
| | Has the earth electrode been correctly fitted? | | | Yes No |
| | Has lightning protection system been tested for electrical continuity? | | | Yes No |
| | Has grounding been correctly installed per manufacturer(s) instruction? | | | Yes No |
| 3.6 | Electrical and solar array cable: | | | |
| | Are all cables the correct size (per electrical diagram)? | | | Yes No |
| | Is the solar array cable type correct for external use? | | | Yes No |
| | Are all cables protected against mechanical damage? | | | Yes No |
| | Are all cables protected against rodent attack? | | | Yes No |

| Solar power system installation checklist | | | Date: | |
|---|---|---|---|---|
| **Country:** | **City/town:** | | **Site name:** | |
| | *Comments:* | | | |
| **CHECK 4 – Battery installation** | | | | |
| 4.1 | Battery set and battery set housing: | | | |
| | Battery housing sufficient to accommodate the specified battery quantity and configuration? | | Yes | No |
| | Accessible for maintenance? | | Yes | No |
| | Battery housing ventilated? | | Yes | No |
| | Protected against the weather? | | Yes | No |
| | Safely located to prevent accidental damage? | | Yes | No |
| | Secured against theft? | | Yes | No |
| | Have battery safety and maintenance instructions been provided? | | Yes | No |
| | Is there a switch or other means to disconnect the battery? | | Yes | No |
| 4.2 | Flooded batteries (where fitted): | Applicable | Not applicable (go to 4.3) | |
| | Are battery casings transparent? | | Yes | No |
| | Was the electrolyte (acid) supplied in a separate sealed container? | | Yes | No |
| | Has the battery safety equipment kit been supplied? | | Yes | No |
| 4.3 | Battery charge regulator: | | | |
| | Is the regulator specified for the battery type (e.g. VELA, FA)? | | Yes | No |
| | Was the regulator pre-set in the factory? | | Yes | No |
| | Does the regulator have a battery capacity indicator? | | Yes | No |
| | Does the regulator have automatic temperature compensation? | | Yes | No |
| | Does the regulator have an optional acoustic alarm? | | Yes | No |
| 4.4 | Fuses: 10 no. spare breaker or fuses in polythene bag fixed next to breaker or fuse box? | | Yes | No |
| | *Comments:* | | | |
| **CHECK 5 – Loads** | | | | |
| 5.1 | List load type(s): | | | |
| | Does CR or FR have a WHO PQS prequalification code number? | | Yes | No |
| | List all load(s) expand as needed | | | |
| | | | | |
| | *Comments:* | | | |
| **CHECK 6 – Wiring installation** | | | | |
| 6.1 | Wiring: | | | |
| | Has the system been wired in accordance with the Legal Manufacturer or Reseller's wiring diagram? | | Yes | No |
| | Are all electrical connections concealed and properly protected? | | Yes | No |
| | Was site installed electrical wiring tested for safety and function? | | Yes | No |
| | *Comments:* | | | |
| **CHECK 7 – Commissioning tests** | | | | |
| 7.1 | Commissioning: have all tests been carried out in accordance with the Legal Manufacturer or Reseller's commissioning instructions? | | Yes | No |
| | If YES, describe/attach tests: | | | |

| Solar power system installation checklist | | | Date: | |
|---|---|---|---|---|
| Country: | City/town: | | Site name: | |
| | If NO, explain why tests have not been carried out: | | | |
| 7.2 | Are all hybrid solar power system components, all back-up power system and all loads functioning properly? | | Yes | No |
| | *Comments:* | | | |
| **CHECK 8 – Documentation** | | | | |
| 8.1 | Documentation check: | | | |
| | Has a user manual been supplied for all system components? | | Yes | No |
| | Are user manuals in the correct language? | | Yes | No |
| | Has a technician's manual been supplied for all system components? | | Yes | No |
| | Are technician's manuals in the correct language? | | Yes | No |
| | Has an Installers manual been supplied? | | Yes | No |
| | Is the installation manual in the correct language? | | Yes | No |
| | Has one complete set of documentation been given to the employer and one set of user's documents been given to the responsible on-site user?? | | Yes | No |
| **CHECK 9 – Overall conclusions and recommendations** | | | | |
| 9.1 | Recommendation: | | Pass | Fail |
| | If FAIL, list outstanding work still required: | | | |
| | If PASS, the installation can be handed over to the user. | | | |

Installation technician's signature: ……..

Date: ……

## Annex 3 – 30-day test checklist

*Note:* The user must complete this checklist for each installation after the first 30 days of operation.

| **Hybrid solar power system 30-day test checklist** | | **Date:** |
|---|---|---|
| **Country:** | **City/town:** | **Site name:** |
| *Instructions for completing this form:*<br>Complete the form 30 days after the hybrid solar power system was handed over to you.<br>Send a copy of the form back to **<name of recipient>.** | | |
| Name:<br>Position:<br>Tel:<br>e-mail: | | |

| | | | |
|---|---|---|---|
| Have you received training (power system? cold room or freezer room)? | | Yes | No |
| Do you have a copy of the *user manual* for the hybrid solar power system, equipment monitoring systems and the cold room or freezer room? | | Yes | No |
| Is the power system working correctly? | | Yes | No |
| Does power system have a battery voltmeter and/or battery capacity indicator? | | Yes | No |
| If YES, how is battery capacity indicated? | | | |
| *Note: Tick NA to the next two questions if the batteries are not transparent.* | | | |
| Can you see the liquid level in the batteries without using tools? | NA | Yes | No |
| Do you know how to top up the batteries with electrolyte (acid)? | NA | Yes | No |
| Were battery maintenance tools and supplies provided? | NA | Yes | No |
| Has the cold room or freezer room worked properly throughout the last 30 days? | | Yes | No |
| List evidence that the cold room or freezer room is working correctly?<br>Examples: temperature chart, data from equipment monitoring system. | | | |
| If you have any comments or questions, please write them here: | | | |
| User's signature: …….<br><br>Date: …… | | | |

| **Revision history** | | | |
|---|---|---|---|
| Date | Change summary | Reason for change | Approved |
| | | | |
| | | | |
| | | | |
| | | | |