Guidelines on the use of Solar Power Systems LTAs when Ordering PV Diesel Hybrid Solar Power Systems:

Prerequisites, LTA Guidelines, Post Installation, and Resources

unicef
unite for children

Table of Contents

1. INTRODUCTION

The aim of establishing LTAS for Solar Power Systems for UNICEF programmes worldwide addresses a solution to reduce the use of diesel generators as a source of power, which leads to a reduction in fuel costs and CO2 emissions in the UNICEF Country offices worldwide, in addition to contributing to cleaner and healthier air where UNICEF operates.

The established solar LTA 42200498 with Peak International Ltd. and LTAs 42200500 and 42200503 with Redondo Y Garcia covers the below requirements:

- ITSS Requirement (Solar power systems and products to meet emergency power needs for communication and telecommunication equipment)
- Solar power systems for Country office electrification (PV Diesel hybrid solar power systems and Solar powered street lights)
- Technical support services.

These guidelines are meant to guide country offices on how to use the Solar Power System LTAs when ordering PV Diesel Hybrid Solar Power System. Also, the prerequisite steps required by the CO to undertake with the support of DFAM's Administrative Management Section before considering the installation of a solar power system, and the post-installation measurement and monitoring processes.

2. PREREQUISITES

Before considering the installation of a solar power system, offices are required to undertake an energy audit/assessment (step 1). If one of the recommendations is the installation of a solar pv system, then ensuring availability of technical expertise and a feasibility study should be undertaken (step 2).

Step 1: Energy Audit/Assessment

What is an energy audit/assessment?

An energy audit helps the office determine the energy consumption associated with its facility and the potential savings associated with recommended investments.

It provides enormous benefits in the following different areas:

- Identifies the steps required to reduce the office's energy costs, while maintaining, if not improving, staff comfort.
- It helps reduce environmental impact through reducing carbon emissions and pollution.
- Contributes to increasing the security of your energy supply.
- Helps increase the life span of equipment at the office.
- It discovers any unaccounted/wasteful energy consumption that may exist at the office
- Identifies the measures that would optimize the solar system's capacity and efficiency.

In summary, an energy audit will first identify energy consumption and energy costs of the facility, then prescribe a set of prescribed measures to eliminate energy waste, maximize efficiency, reduce environmental impact and optimize energy supply.

Finally, it will provide a clear way forward on the feasibility, optimal size, and type of solar power system required.

Steps required to undertake an energy assessment:

- Reach out to DFAM's Administrative Management Section – the Inclusive and Sustainable Operation team (wabiabdallah@unicef.org, hmartinez@unicef.org, nmerritt@unicef.org), while providing the following information:
    - Type of tenancy, and in case of building lease, the length and status of the lease.
    - Yearly energy costs – grid electricity and diesel fuel (if generators are used).
    - Energy use intensity, in kWh/square meter.
    - Carbon emissions from facilities.
- If the office is eligible, the terms of reference for hiring an energy audit/assessment consultant will be shared.
- The office will then issue a request for proposals based on the terms of reference.
- DFAM's Administrative Management Section – the Inclusive and Sustainable Operation team will provide the funding to cover the costs of the assessment
- DFAM's Administrative Management Section – the Inclusive and Sustainable Operation team will provide the support for undertaking the technical evaluations of the proposals received by the office.
- The funds will be released in the form of a Fund Requisition, following the completion of the financial evaluation by the office.

During an energy assessment:

- The office is advised to immediately share any queries raised by the entity undertaking the energy audit with the Inclusive and Sustainable Operation team.
- All preliminary and draft reports should be shared with the Inclusive and Sustainable Operation team for quality control and validation before any milestone or final payment is issued.
- The onsite measurements typically take no more than a week, and the generating the draft and final reports should take between 4 and 6 weeks.

After the energy assessment is completed:

- The office is required to share the final report and annexes with the Inclusive and Sustainable Operation team and schedule a call to go through the report's recommendations and prescribed projects.
- Based on the analysis of the prescribed projects, which includes their simple payback period and anticipated environmental and operating cost impact, the office will proceed with the procurement of the equipment/fixtures based on the specifications listed in the report, including any subscribed solar power generation system.
- For inverter / VRV air conditioners, LED lights and efficient lighting systems, occupancy/vacancy sensors, building insulation, glazing, timer switches, energy meters, shading devices, window and door seals, or any other prescribed projects other than Solar power systems, the office can proceed with locally procuring the required equipment and fixtures.

- If one of the prescribed measures/projects is the installation of a solar power system, the following section provides the necessary steps and guidance.
- The office should make sure that the total energy load is reduced prior /in parallel to installing the photovoltaic system, and should only proceed if the installation of such system is deemed feasible as prescribed in the energy assessment report.

IF A SOLAR POWER SYSTEM IS RECOMMENDED BY THE ENERGY ASSESSMENT, PROCEED TO STEP 2.

Step 2: Assurances and Feasibility Study

If the energy assessment recommends the installation of a solar power system, the office should ensure the following:

Technical Expertise Availability:

Country Offices should ensure there is availability of technical expertise and support in the sizing, installation operation and maintenance of the solar power systems.

In cases where there is a lack of technical expertise, UNICEF Supply Division (SD) launched a tender for global LTAS-DO LTA No's 42105765 with Trama TecnoAmbiental, S.L., Spain and 42105767 with Gamma Solutions S.L., Spain FOR Direct Ordering of Solar Electrification Support Consultancy services.

The process led to selection of two (2) LTAS holders with capacity to support the Offices in different parts of the world.

The objectives of the consultant/consultancy are to:

- Provide technical support to the Offices in tender processes for solar systems
- Provide technical advice to the Offices related to solar systems such as: Solar feasibility analysis (refer to section below), needs assessment, cost/benefit analysis, project scoping, requirements definition, site survey, etc.
- Develop tender ready solar system specifications/requirements for specific the Offices
- Support the technical review of tender submissions for the office solar system
- Support the Offices in the Supervision and quality assurance of the project implementation

Solar Power Feasibility Analysis

A feasibility analysis will ascertain your energy consumption profile. An energy consumption profile includes an analysis of existing energy use and viability of solar for your building and/or site, including a recommendation of the optimal-sized system.

The feasibility analysis will consider:

- The current electricity and fuel consumption of the building or site, including identifying monthly peak and off-peak loads
- What portion of electricity is likely to be generated by solar panels.
- The optimal-sized system, orientation, slope and location for the building or site and whether battery storage should be included.
- The suitability of the roof and/or site area for the installation. Structural engineering advice will be required including on-site inspection and verification.

- Detailed maintenance requirements for the proposed PV system, including essential items to be included in contract with supplier and any associated costs. It is a good practice for contractors of solar PV systems to provide an operation & maintenance ("O&M") manual for the client. The manual should include basic system data, test and commissioning data, O&M data, and warranty information.
- An analysis of the available procurement options and a justification of the preferred option, one option being the current two LTAs.
- Identify estimated costs, savings and risks associated with the proposal.
- Any plans by the CO on expansion or relocation and any other relevant information that will assist in having an accurate feasibility analysis.

3. STANDARD SOLAR POWER SYSTEM, INCLUDING PV DIESEL HYBRID SYSTEMS LTAS

The Standard Photo Voltaic Diesel Hybrid Solar Systems have been sized x1.5 to get the total Watt-hours per day which must be provided by the panels and to give the system autonomy from the Generator.

The established solar LTA 42200498 with Peak International Ltd. and LTAs 42200500 and 42200503 with Redondo Y Garcia covers the below requirements:

S0006912 4KW 50Hz 1P Photo Voltaic Diesel Hybrid Solar Power System
S0006913 4KW 60Hz 1P Photo Voltaic Diesel Hybrid Solar Power System
S0006915 6KW 60Hz 3P Photo Voltaic Diesel Hybrid Solar Power System
S0006916 6KW 60Hz 3P Photo Voltaic Diesel Hybrid Solar Power System
S0006922 10KW 50Hz 3P Photo Voltaic Diesel Hybrid Solar Power System
S0006923 10KW 60Hz 3P Photo Voltaic Diesel Hybrid Solar Power System
S0006919 50KW 50Hz 3P Photo Voltaic Diesel Hybrid Solar Power System
S0006920 50KW 60Hz 3P Photo Voltaic Diesel Hybrid Solar Power System

Considering the possibility of relocating PV systems among Country Office the 60Hz system has been designed based on the same components of the 50Hz system. For 60 Hz system, the Country Office needs only to add a transformer making it simple for operation and cost effective.

Refer to Annex 1 for more information on how a PV Diesel Hybrid Solar Power System Works, along with information on the design criteria used in both LTAs.

Three Basic Steps to Follow When Using the LTAs

Step 1: Start by determining the power load in KW to be supported by the solar power system.

Step 2: Identify which standard solar power system solution within the LTA will support the determined load power in KW/hr.

For customised solar power systems that cannot be supported by the standard solutions in the LTAs, the CO will be required to share with the Supplier/ Supply Division the feasibility study/ analysis performed including the proposed solar power system size based on the standard solar power systems and spare parts in the LTAs.

Step 3: Proposed solutions from the supplier must be approved by the CO technical focal point or consultant hired by the CO to confirm the system is Ok and will meet the CO power requirements.

Material Number U431454 is to be used when raising Preq. for Customised Solar Power system based on the LTA. Quotations provided in this regard should be referenced to the LTA solar power systems and spare part prices. In cases, whereby the system is to be stored in the warehouse CO should change material U number to an SL Material Number.

Solar Power System Warranty

Ideally it is advisable that CO explores local, regional or cross border markets on availability of solar power systems and after sale service. Finding local solution will ensure availability of technical expertise, this will also ensure ease of availing service and parts which falls under warranty. CO can also establish SLA contracts with service providers to maintain the system.

Manufacturers' warranty needs to be provided for each solar system/component. Any component which fails due to defective design, materials or workmanship must be covered by a replacement warranty. The minimum periods for the warranty must be as follows:

- Photovoltaic Modules -twenty (25) years for maintaining power output.
- Batteries – five (5) years performance warranty with a full like-for-like replacement warranty for the first 12 months and pro-rated financial compensation, based on the purchase cost of the battery set, for the remaining period.
- Two (2) years for all other components

Solar power system Installations will require a separate warranty in addition to the product warranty provided in the LTAs from the entities performing the installations.

1. POST INSTALLATION

Following the installation of a solar power system, it is of utmost importance to maintain, measure, monitor, and report its performance.

Why monitor energy use?

We cannot manage what we cannot measure. Energy initiatives too often are one-time upgrades that are not monitored and measured properly over time. As a result, the benefits of these improvements are soon lost. The key to reducing energy use and sustaining decreases over time is providing the right information, to enable informed decisions that balance energy use with other objectives, such as building comfort and employee productivity.

How to measure and monitor energy use?

To keep it simple, measuring and monitoring energy use can be done through installing energy meters and sub-meter, ideally internet-connected devices. They main energy meter is installed at the main electric supply of the entire facility, while the sub-meters are typically installed on every floor. Sub-meters are also ideal for UNICEF offices occupying shared premises, as they help with looking at UNICEF's individual energy consumption.

2. OTHER RELEVANT RESOURCES

Intranet Pages

Eco-efficient and Inclusive UNICEF

https://icon.unicef.org/iconhome/Pages/Eco-efficient-and-Inclusive-UNICEF.aspx

Sustainable Procurement Knowledge Portal

http://danaapps01.unicef.org/Denmark/danhomepage.nsf/0/489C3F919300A78EC12581F400353D50?open&expandlevel=MainLevel7&expandlevel2=SecondLevel47

Contacts

Supply Division:

Danielle Jenei, djenei@unicef.org, Procurement Assistant, WSEC, UNICEF Supply Division

Paul Ongaya, pongaya@unicef.org, Technical Officer, WSEC, UNICEF Supply Division

Anne Cabrera- Clerget, acabreraclerget@unicef.org, Contracts Manager, WSEC, UNICEF Supply Division

DFAM:

Nicole Merritt, nmerritt@unicef.org, Administrative Assistant, FSU-ISO, UNICEF DFAM-AMS

Heidy Martinez, hmartinez@unicef.org, Administrative Officer, FSU-ISO, UNICEF DFAM-AMS

William Abi Abdallah, wabiabdallah@unicef.org, Administrative Specialist, FSU-ISO, UNICEF DFAM-AMS

ANNEX 1

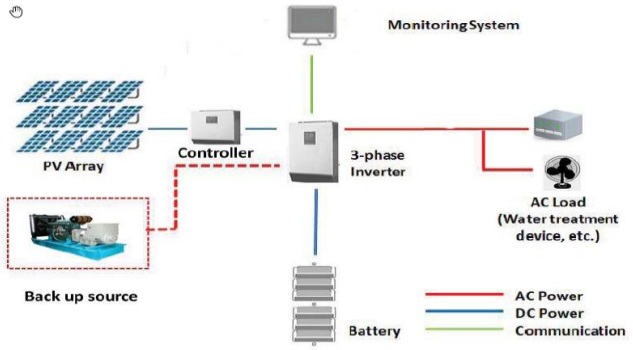
A - HOW DOES A PV DIESEL HYBRID SOLAR POWER SYSTEM WORK?

A photovoltaic diesel hybrid system ordinarily consists of a PV system, diesel gensets and intelligent management to ensure that the amount of solar energy fed into the system exactly matches the demand at that time.

The PV system can supply additional energy when loads are high or relieve the genset to minimize its fuel consumption. Excess energy from the PV panels is stored in batteries. When solar irradiation is insufficient or energy is needed after dark, the storage battery supplies the required energy, ensuring optimal hybrid system operation.

Intelligent management of various system components ensures optimal fuel economy and minimizes CO_2 emissions.

Schematic Diagram a Photo Voltaic Diesel Hybrid Solar Power System



B- DESIGN CRITERIA USED FOR PV DIESEL HYBRID SOLAR POWER SYSTEMS IN BOTH LTAS.

The PV Solar system has been designed to provide the load defined in each facility by the PV Modules and Batteries, the excess power requirement could be delivered by Diesel Generator (not included).

4.1 In general, the systems in the LTAs were designed according with following criteria:

- The PV array is the main source of power, a Diesel Generator would only operate as back-up.
- The battery bank will be used to store energy produced by photovoltaic modules during radiation period.
- Bi-directional inverter will be regulating the system by charging or discharging of the battery bank, this inverter will protect the battery bank from over charge/discharge.
- Mono-directional inverter convert DC from PV modules to AC, to provide AC service to loads defined.
- When the power from PV system is not available a diesel generator could supply power to AC load and charge the batteries through bi-directional inverter.
- The system is designed such a way that a diesel generator automatically would come on during the peak loads demands.

- Once the batteries are fully charged, a generator would automatically shut down and leave the systems to be operated by the battery bank or PV system without interruptions.
- A diesel generator could be expected to supply power or come on during night time. On normal days, the PV system and the battery bank would supply power during the day time.
- If the battery bank drained beyond the low limit, the bi-directional inverter would generate a signal to start a diesel generator for supplying power to AC load and charge the battery bank automatically.

4.2 The PV systems in this LTAs have been designed in consideration to the following operational conditions:

- Region. - Tropical and semi tropical
- Temperature. - Varying between – 5ºC to plus 50ºC
- Altitude. - Up to 1200 masl
- Humidity. - Up to 85%
- Average daily sunshine: 5 PSH (Peak Sun Hours)
- Wind speed:200 km/h

4.3 General assumption about power consumption is as following:

- All appliances in a facility/building are expected to be operational any moment within 24 hours' day cycle.
- Average daily irradiation. - 5,0 kWh/m2/day

Future expansion of the PV system will be possible by the modular concept to form a mini-grid.