
CGO Complex, Block No.14,
Lodhi Road, New Delhi – 110003
Date: 08-June-2021

NOTICE

Subject: Request for comments on specifications and testing procedures for solar off-grid applications - regarding

Ministry has issued specifications and testing procedures for various Off-grid Solar applications covered MNRE Programme/Schemes. These specifications are updated by the Ministry from time-to time to incorporate innovations and technological improvements in such applications. It has been observed from the market that there have been improvements in performance parameters over time and therefore it would be prudent to revise these specifications accordingly.

2. It is proposed to update the following specifications and testing procedures for applications covered under MNRE Programme/Schemes (attached in the given order):

1. Specification for the Solar Street lights (Annexure- A)
2. Specification for the SPV water pumping systems (Annexure- B)
3. Specification for the SPV micropumps (Annexure- C)
4. Specifications of Solar Study lamps (Annexure- D)
5. Testing procedure for the SPV water pumping systems (Annexure- E)
6. USPC specification and testing procedure (Annexure- F)

3. All concerned stakeholders are requested to provide their suggestions for updation of these specifications, *separately*, in the following format in word document:

Suggestions for the Specification/Testing procedure of.....

<i>S.No.</i>	<i>Present Clause</i>	<i>Modification Proposed</i>	<i>Justification</i>

Reference documents/ calculations referred in justification may also be provided along with comments.

4. Views & suggestions may please be sent through email to Shri Aditya Gangwar, Scientist-B at adityagangwar.mnre@gov.in by 21 June 2021.


(Shobhit Srivastava)
Scientist-D

To,

All concerned

Annexure A

TECHNICAL SPECIFICATIONS FOR 12 W WHITE-LED BASED SOLAR STREET LIGHTING SYSTEM

Sr. No	Components	Specification for Solar street light fitting
1.	PV module	75 Wp under STC
2.	Battery	Minimum 12.8V, 30 AH capacity Lithium battery.
3.	Light Source	White Light Emitting Diode (W-LED) 12-Watt, W-LED luminaire, dispersed beam, shooting to eyes with the use of proper optics and diffuser. LED Chip should be compliance to IES: LM-80 (Approved Method for Measuring Lumen Maintenance of LED Light Sources and LED lumen depreciation time to L70). Test report for same should be submitted.
4.	Light Output	The luminaire must use high efficacy W-LED with minimum 135 lumens per watt (and UV free). [A certificate to be submitted by the System supplier to the Test Lab during certification] For single light level: Minimum 24 Lux when measured at a point 4 meters below the light. The illumination should be uniform without dark bands or abrupt variations, and soothing to the eye. Higher light output will be preferred. For Multiple Light levels: The luminaire should have two levels of light to take care of different lighting needs during the night. Minimum 24 Lux when measured at a point 4 meters below the light (at” High” illumination level). The illumination Should be uniform without dark bands or abrupt variations. Minimum 12 Lux at lower illumination level. (Higher light output will be preferred) The luminaire shall be tested for Electrical, Photometry and Color parameters as per IES LM-79:2008 or IS: 16106:2012 for following performance parameters like:

		<ol style="list-style-type: none"> 1) Total luminous flux: ≥ 1500 lm. 2) Luminous efficacy (i.e. system efficacy): ≥ 125 lm/W. 3) Color Temperature: Between 5500°K to 6500°K. 4) CRI ≥ 70 5) Luminous intensity distribution should follow the batwing patterns in polar curves. 6) Require validation report using .ies file, which is generated during luminous intensity distribution test and using maintenance factor 0.9 and pole height of 4m., Road width 5m and Pole span 15m. The average illuminance level and uniformity should comply with requirement as per IS 1944, wherever applicable. 7) The luminaire should be tested for all type tests as per IS 10322 Part 5 Sect 3 or IEC 60598-2-3 standards.
5.	Mounting of light	Pole height 5 m above the ground level and 1 m below the ground. Luminaire shall be at least 4.5 m above the ground level.
6.	Electronics Efficiency	Overall total Efficiency of the Electronics should be Minimum 90%
7.	Duty Cycle	Dusk to dawn: First 4 Hours full light (Min. 24 Lux), rest of the time at lower light (50%, Min. 12 Lux) level. (Higher light output will be preferred)
8.	Autonomy	3 days or Minimum 36 operating hours per permissible discharge with fully charged Lithium Battery.
9.	Ingress Protection – IP	Optical and Control gear compartment - IP 65 / IP 66
10.	Impact resistance of casing	\geq IK 08
11.	Radiated Emission Test	As per CISPR-15
12.	ESD (Electro Static Discharge) and Radiated susceptibility test	As per IEC 61547

TECHNICAL DETAILS

PV MODULE

- i. Indigenously manufactured PV module should be used.
- ii. The PV module should have crystalline silicon solar cells and must have a certificate of testing conforming to IEC 61215 Edition II / BIS 14286 from an NABL or IECQ accredited Laboratory.
- iii. The power output of the module under STC should be a minimum of 75Wp.
- iv. The module efficiency should not be less than 14 %.
- v. The terminal box on the module should have a provision for opening it for replacing the cable, if required.
- vi. There should be a Name Plate fixed inside the module which will give:
 - a. Name of the Manufacturer or Distinctive Logo.
 - b. Model Number
 - c. Serial Number
 - d. Year of manufacture

A distinctive serial number starting with NSM will be engraved on the frame of the module or screen printed on the tedlar sheet of the module.

BATTERY

All Lithium based batteries, fulfilling following performance parameters, shall be used for Solar Study Lamps under the Off-grid and Decentralized Solar PV Applications Programme of the Ministry:

Parameter	Qualifying condition
Specific Energy	Minimum 120 Wh/ kg
C Rate (Charging)	Minimum C/4
C Rate (Discharging)	Up to 1C
Charge Discharge Cycles	Minimum 2000 cycles at C/10 rate at 25°C
Thermal Runaway	Minimum 120 °C
Depth of discharge	Minimum 85% at 25 °C
Temperature of operation	10 to 50 °C (with thermal management system for ambient temperatures lower and higher than the given range)

- i. Battery pack should have proper 'Battery management System' (BMS) for cell balancing, over charge and over temperature protection.
- ii. Battery should conform to the latest BIS/ International standard

LIGHT SOURCE

- i. The light source will be a white LED type.
- ii. The colour temperature of white LED used in the system should be in the range of 5500°K–6500°K.
- iii. W-LEDs should not emit ultraviolet light.
- iv. The light output from the white LED light source should be constant throughout the duty cycle.
- v. The lamps should be housed in an assembly suitable for outdoor use.
- vi. The temperature of heat sink should not increase more than 20°C above ambient temperature during the dusk to dawn operation.

ELECTRONICS

- i. The total electronic efficiency should be at least 90 %.
- ii. Charge controller should be MPPT Type.
- iii. Electronics should operate at an appropriate voltage suitable for proper charging of the battery.
- iv. No Load current consumption should be less than 20 mA.
- v. The PV module itself should be used to sense the ambient light level for switching ON and OFF the lamp.
- vi. The PCB containing the electronics should be capable of solder free installation and replacement.
- vii. Necessary lengths of wires/cables, switches suitable for DC use and fuses should be provided.

ELECTRONIC PROTECTIONS

- i. Adequate protection is to be incorporated under “No Load” conditions e.g. when the lamp is removed and the system is switched ‘ON’.
- ii. The system should have protection against battery overcharge and deep discharge conditions.
- iii. The System should have protection against short circuit conditions.
- iv. Protection for reverse flow of current through the PV module(s) should be provided.
 - v. Adequate protection should be provided against battery reverse polarity.
- vi. Load reconnect should be provided at 80% of the battery capacity status.

MECHANICAL COMPONENTS

- i. A corrosion resistant metallic frame structure should be fixed on the pole to hold the SPV module.
- ii. The frame structure should have provision so that the module can be oriented at the suitable tilt angle.
- iii. The pole should be Hot dip galvanized pipe as per IS1161 & IS4736 i.e. Class B with 76.1mm Dia & 3.6±10% mm thickness of the pole.
- iv. Pole height 5 m above the ground level and 1 m below the ground. Luminaire shall be at least 4.5 m above the ground level.
- v. The pole should have the provision to hold the luminaire.

- vi. The battery shall be either included in the luminaire enclosure, which should be water proof (IP 65) and corrosion resistant or outside the luminaire enclosure in a vented, acid proof and corrosion resistant, hot dip galvanized metallic box (IP 65) with anti-theft locking arrangement for outdoor use.

INDICATORS

- The system should have two indicators, green and red.
- The green indicator should indicate the charging under progress and should glow only when the charging is taking place. It should stop glowing when the battery is fully charged.
- Red indicator should indicate the battery “Load Cut Off” condition.

QUALITY AND WARRANTY

- i. The street lighting system (including the battery) will be warranted for a period of five years from the date of supply.
- ii. The PV module(s) will be warranted for a minimum period of 25 years from the date of supply. The PV modules must be warranted for their output peak watt capacity, which should not be less than 90% at the end of Ten (10) years and 80% at the end of Twenty-five (25) years.
The Warranty Card to be supplied with the system must contain the details of the system.

OPERATION AND MAINTENANCE MANUAL

An Operation, Instruction and Maintenance Manual, in English and the local language, should be provided with the Solar Street Lighting System. The following minimum details must be provided in the Manual:

- Basic principles of Photovoltaics.
- A small write-up (with a block diagram) on Solar Street Lighting System - its components, PV module, battery, electronics and luminaire and expected performance.
- Type, Model number, Voltage & capacity of the battery, used in the system.
- The make, model number, country of origin and technical characteristics (including IESNA LM-80 report) of W-LEDs used in the lighting system.
- About Charging and Significance of indicators.
- Clear instructions about erection of pole and mounting of PV module (s) and lamp housing assembly on the pole.
- Clear instructions on regular maintenance and troubleshooting of the Solar Street Lighting System.
- DO's and DONT's.
- Name and address of the contact person for repair and maintenance, in case of non-functionality of the solar street lighting system.

List of BIS standards applicable for components of Solar PV Applications

Sl. No. (1)	Product (2)	Indian Standard Number (3)	Title of Indian Standard (4)
1.	Crystalline Silicon Terrestrial Photovoltaic (PV) modules (Si wafer based)	IS 14286	Crystalline Silicon Terrestrial Photovoltaic (PV) modules – Design Qualification and Type Approval
2.	Thin Film Terrestrial Photovoltaic (PV) Modules (a-Si, CiGs and CdTe)	IS 16077	Thin-Film Terrestrial Photovoltaic (PV) Modules -Design Qualification and Type Approval
3.	PV Module (Si wafer and Thin film)	IS/ IEC 61730 (Part 1) IS/ IEC 61730 (Part 2)	Photovoltaic (PV) Module Safety Qualification Part 1 Requirements for Construction Photovoltaic (PV) Module Safety Qualification Part 2 Requirements for Testing
4.	Power converters for use in photovoltaic power system	IS 16221 (Part 1) IS 16221 (Part 2)	Safety of Power Converters for use in Photovoltaic Power Systems Part1- General Requirements Safety of Power Converters for Use in Photovoltaic Power Systems Part 2-Particular Requirements for Inverters
5.	Storage batteries	IS 16270	Secondary Cells and Batteries for Solar Photovoltaic Application General-Requirements and Methods of Test.
6.	LED Lights & Luminaires	IS 16101 IS 16102 IS 16103 IS 16107	General Lighting - LEDs and LED modules – Terms and Definitions Self-Ballasted LED Lamps for General Lighting Services Led Modules for General Lighting Luminaires Performance Luminaires Performance.

Annexure B

SPECIFICATION FOR SOLAR PHOTOVOLTAIC WATER PUMPING SYSTEMS

1. SCOPE

These specification covers design qualifications and performance specifications for Centrifugal Solar Photo Voltaic (SPV) Water Pumping Systems from 0.75kW/1 HP up to 11.25kW/15 HP to be installed on a suitable bore-well, open well, water reservoir, water stream, etc., and specifies the minimum standards to be followed under New Scheme for Farmers launched by Government of India on 8.3.2019.

2. TERMINOLOGY

In addition to the terminology specified in 3 of IS 5120 and IEC 62253, the following shall also apply.

2.1 Static Water Depth — It is the depth of water level below the ground level when the pump is not in operation.

2.2 Draw-Down — It is the elevation difference between the depth of static water level and the consistent standing water level in tube well during operation of pump set.

2.3 Submergence — It is the minimum height of water level after drawdown above the pump suction casing.

2.4 Manometric Suction Lift — Manometric suction lift is the vacuum gauge/suction manometer reading in meter of water column when pump operates at suction lift.

2.5 Static Suction Lift — Static suction lift/head is the vertical distance between sump water level and center of pump inlet.

2.6 Daily Water Output — It is the total water output on a clear sunny day with three times tracking SPV panel, under the “Average Daily Solar Radiation” condition of 7.15 KWh / m² on the surface of SPV array (i.e. coplanar with the SPV Modules).

2.7 Wire to Water Efficiency — It is the combined system efficiency of SPV Converter/Controller with Inbuilt MPPT mechanism, Pump set and piping.