

## **LED SOLAR HOME LIGHTING SYSTEMS**

**All interested manufacturers / product developers are requested to give comments on the following draft specifications**

### **DEFINITION**

Light Emitting Diode (LED) is a device which emits light when an electric current passes through it. A LED based solar home lighting system aims at providing solar electricity for operating LED lights and / or other small DC loads for specified hours of operation per day.

The broad performance specifications of a Light Emitting Diode (LED) light source based solar home lighting system are given below.

### **BROAD PERFORMANCE PARAMETERS**

Light Source	White Light Emitting Diode (W-LED)
Light Out put	White colour, minimum six lux when measured from a height of about eight ft and illuminated over an area of at least six ft dia. Higher light output will be preferred.
Mounting of light	Wall or ceiling
PV Module	Six Wp under STC, measured at 16.4 V as Vload Module Voc minimum of 21 V
Battery	Sealed maintenance free, 12 V- 7 AH @ C/20, Max DoD 75%
Electronics	Min 72% total efficiency
Average duty cycle	4 hours a day
Autonomy	Minimum of 3 days

### **Other Details**

#### **DUTY CYCLE**

The LED solar home lighting system should be designed to operate for average 4 hours a day, under average daily insolation of 5 kWh /sq.m. on a horizontal surface.

#### **LIGHT SOURCE**

- (i) The light source will be of white LED type. Single lamp or multiple lamps can be used. Wider view angles preferred. The luminous performance of LEDs used should not be less than 30 lumen/watt. Use of LEDs which emit ultraviolet light should be avoided.

- (ii) The light output from the light source should be constant.
- (iii) The lamps should be housed in an assembly suitable for indoor use. While fixing the assembly, the lamp should be held in a base up configuration.
- (iv) The make, model number, country of origin and technical characteristics of LEDs should be furnished to the test centres

## **BATTERY**

- (i) Sealed maintenance free battery. Battery should conform to latest BIS standards or international standards. A copy of the test certificate should be provided to the test centre.
- (ii) 75 % of the rated capacity of the battery should be between fully charged & load cut off conditions.

## **ELECTRONICS**

- (i) The total electronic efficiency should be at least 72 %.
- (ii) The idle current consumption in the charge controller should not be more than 1 mA
- (iii) Electronics should operate at 12 V and should have temperature compensation for proper charging of the battery through out the year.
- (iv) The light output should remain constant with variations in the battery voltages.
- (v) Necessary lengths of wires / cables, switches suitable for DC use and fuses should be provided.

## **PV MODULE**

- (a) The PV module shall contain crystalline silicon solar cells
- (b) The operating voltage corresponding to the power output mentioned above should be 16.4 V.
- (c) The open circuit voltage of the PV modules under STC should be at least 21.0 Volts.
- (d) The terminal box on the module should have a provision for opening for replacing the cable, if required.
- (e) A strip containing the following details should be laminated inside the module so as to be clearly visible from the front side:
  - a) Name of the Manufacturer or distinctive Logo
  - b) Model or Type No.
  - c) Serial No.
  - d) Year of make

## **ELECTRONIC PROTECTIONS**

- (i) Adequate protection is to be incorporated under no load conditions, e.g. when the lamps are removed and the system is switched ON.
- (ii) The system should have protection against battery overcharge and deep discharge conditions. The numerical values of the cut off limits must be specified, while submitting the samples for the testing purposes.
- (iii) Fuses should be provided to protect against short circuit conditions.
- (iv) A blocking diode should be provided as part of the electronics, to prevent reverse flow of current through the PV module(s), in case such a diode is not provided with the PV module(s).
- (v) Full protection against open circuit, accidental short circuit and reverse polarity should be provided.

## **MECHANICAL COMPONENTS**

- (i) Metallic frame structure (with corrosion resistance paint) to be fixed on the roof of the house to hold the SPV module. The frame structure should have provision to adjust its angle of inclination to the horizontal between 0 and 45, so that it can be installed at the specified tilt angle.
- (ii) It should be possible to mount the light source on a wall or ceiling or hang it from the ceiling.
- (iii) A vented metallic / plastic / wooden box with acid proof corrosion resistance paint for housing the storage battery indoors should be provided.

## **OTHER FEATURES**

- (i) The system should be provided with 2 LED indicators: a green light to indicate charging in progress and a red LED to indicate deep discharge condition of the battery. The green LED should glow only when the battery is actually being charged.
- (ii) There will be a Name Plate on the system which will give:
  - (a) Name of the Manufacturer or Distinctive Logo.
  - (b) Serial Number.
- (iii) An independently operated White LED can be provided (optional) for use as a night lamp.
- (iv) A socket can be provided to energize a small radio or other small DC load of wattage not exceeding 500 mill watts.

## **QUALITY AND WARRANTY**

- (iii) Components and parts used in LED solar home systems should conform to the latest BIS / international specifications, wherever such specifications are available and applicable. A copy of the test report / certificate stating conformity of BIS / international standards must be submitted to the test centre.

- (iv) The PV module will be warranted for a minimum period of 10 years from the date of supply and the LED solar home system including the battery, will be warranted for a period of at least 2 years from the date of supply.

## **DOCUMENTATION**

- (v) An Operation, Instruction and Maintenance Manual, in English and the local language, should be provided with the solar home system.

The following minimum details must be provided in the Manual:

- (a) About Photovoltaics
- (b) About LED solar home system - its components and expected performance
- (c) About PV module. In case of imported modules it is mandatory to provide a copy of the international product qualification certificate to the test centre.
- (v) About LED Lights. The make, model number, country of origin and technical characteristics of LEDs should be stated in the product data sheet and furnished to the test centres
- (e) About battery.
- (f) Clear instructions about mounting of PV module.
- (g) About electronics.
- (h) About charging and significance of indicators.
- (i) DO's and DONT's,
- (j) Clear instructions on regular maintenance and trouble shooting of solar home system.
- (h) Name and address of the person or service center to be contacted in case of failure or complaint.