



TECHNICAL SPECIFICATION OF SOLAR HOME LIGHT SYSTEM:

A solar home lighting system (SHS), converts solar energy into electricity and provides a comfortable level of illumination in one or more rooms of a house. There are several SHS models featuring one, two, or four CFLs (Compact Fluorescent Lamps). The system could also be used to run a small DC fan or a 12-V DC television along with the CFL (s).

The SHS consists of a PV module of 18 or 37 or 74 Wp capacity, a lead-acid battery (of 12 V and 20 or 40 or 75 AH capacity respectively) and CFLs of 9 W or 11 W rating. The system is designed to work for three to four hours daily, with an autonomy of three days i.e. the system can function for three consecutive cloudy days.

A PV module is usually mounted on the roof of the house or any other convenient place so that it is exposed to direct solar radiation throughout the day, avoiding any shadow. The module converts incident solar radiation into electricity, which, in turn, charges the battery. The battery is placed inside the house. The battery provides power to the CFLs, and/ or the television/ fan as required. A charge controller prevents overcharging and deep discharge of the battery.

DUTY CYCLE

All the models of Solar Home Lighting Systems should be designed to operate for 3-4 hours daily. The actual duration of lighting could vary depending on the location and season, etc.

□ Technical Specifications & General Specifications:

Model Component

Specifications

PV Module 1 x 18 W under STC

Lamp 1 x CFL (9W/11W)

Battery 1 x 12V, 20AH. Tubular Positive Plate flooded electrolyte,

Lead Acid Battery or VRLA or Gel Type

Model-1

- One Light Point
- Control electronics.
- Module mounting hardware
- Battery box
- Inter connecting wires / cables, Switches,
- Operation, instruction and maintenance manual.
- PV Module 1 x 37 W under STC
- Lamp 2 x CFL (9W/11W)

Model-2

- Two Lights
- Battery 1 x 12V, 40AH.
- Tubular Positive Plate flooded electrolyte
- Lead Acid Battery or VRLA or Gel Type.
- Control electronics
- Module mounting hardware, Battery box
- Inter connecting wires/cables
- Switches,
- Operation instruction and maintenance manual.
- PV Module 2 x 37 W or 1x74 W under STC
- Lamp 2 x CFL (9W/11W)
- Fan 1 x DC Fan (with wattage less than 20W)
- Battery 1 x 12V, 75AH. Tubular Positive Plate flooded electrolyte,
- Lead Acid Battery or VRLA or Gel Type.

Model - 3

- 2 Lights & 1 Fans
- Control electronics
- Module mounting hardware
- Battery box.
- Inter connecting wires/cables, Switches,
- Operation instruction and maintenance manual.
- PV Module 2 x 37 W or 1x74 W under STC
- Lamp 4 x CFL (9W/11W)
- Battery 1 x 12V, 75AH.
- Tubular Positive Plate flooded electrolyte
- Lead Acid Battery or VRLA Gel Type.

Model - 4

- 4 Lights
- Control electronics.
- Module mounting hardware,
- Battery box
- Inter connecting wires/cables, Switches,
- Operation, instruction and maintenance manual.
- **Notes:**

i) All models should have a socket to provide power for a 12V DC TV set which can be purchased separately.

ii) A small white LED could be provided as an optional feature, with an independent switch.

1) PV MODULE (S)

(a) Both crystalline and thin film technology modules are allowed in the system. The PV module should have a certificate of testing conforming to IEC 61215 Edition II / BIS 14286 or IEC 61646 for crystalline and thin film PV modules respectively. The manufacturer should produce the certificate for a higher wattage module, in case the certificate is not available for the offered PV module. Further, the manufacturer should certify that the supplied module is also manufactured using similar material, design and process as that of the certified PV module. The certificate should be from an NABL or IECQ accredited Laboratory.

(b) The power output of the module(s) under STC should be a minimum of 18 Wp or 37 Wp or 74 Wp. In case of **Model-4** either two modules of 37 Wp each or one module of 74 Wp can be used. For thin film PV modules, the specified values refer to the stabilized power output after the initial degradation. **The module efficiency should not be less than 12%.**

(c) The operating voltage corresponding to the power output mentioned above should be $16.4 \pm 0.2V$.

(d) The open circuit voltage of the PV modules under STC should be at least 21.0 Volts.

(e) The terminal box on the module should have a provision for opening for replacing the cable, if required.

(f) Each PV module must use a RF identification tag (RFID), which must contain the following information:

- (i) Name of the manufacturer of PV Module
- (ii) Model or Type Number
- (iii) Serial Number
- (iv) Month and year of the manufacture
- (v) I-V curve for the module
- (vi) Peak Wattage of the module at 16.4 volts
- (vii) I_m , V_m and FF for the module
- (viii) Unique Serial No and Model No of the module

Until March 2013, the RFID can be inside or outside the module laminate, but must be able to withstand harsh environmental conditions. **However from 1st April 2013 onwards; RFID shall be mandatorily placed inside the module laminate.**

(g) A distinctive serial number starting with NSM will be engraved on the frame of the module. The distinctive number starting NSM will also be screen printed on the tedlar sheet of the module.

2) BATTERY

- (i)** The battery will be Lead Acid, Tubular positive plate flooded electrolyte or Gel or VRLA Type
- (ii)** The battery will have a minimum rating of 12V, 20 or 40 or 75 Ah (at C/10) discharge rate depending on Model.
- (iii)** 75 % of the rated capacity of the battery should be between fully charged & load cut off conditions.

3) LAMPS

- (i)** The lamp should be a 9 and 11 Watt compact fluorescent lamp (CFL) with 4 pins only along with proper pre-heating circuit.
- (ii)** The light output from the lamps should be around 600 ± 5 % lumens (for 9 W CFL) and 900 ± 5 % lumens (for 11 W CFL).
- (iii)** The lamps should be housed in an assembly suitable for indoor use, with a reflector on its back. While fixing the assembly, the lamp should be preferably held in a base up configuration.
- (iv)** No blackening or reduction in the lumen output by more than 10% should be observed after 1000 ON/OFF cycles (two minutes ON followed by four minutes OFF is one cycle).

4) ELECTRONICS

- (i)** The inverter should be of quasi sine wave/sine wave type, with frequency in the range of 20 - 30 kHz. Half-wave operation is not acceptable.
- (ii)** The total electronic efficiency should not be less than 85 %.
- (iii)** The idle current consumption should not be more than 10 mA

5) DC FAN

The wattage of the fan should not be more than 20 Watts and it should operate at 12V DC.

6) ELECTRONIC PROTECTIONS

- (i)** Adequate protection is to be incorporated under no load i.e. when the lamps are removed and the system is switched ON.
- (ii)** The system should have protection against battery overcharge, deep discharge condition.

(iii) Fuses should be provided to protect against short circuit conditions.

(iv) Protection for reverse flow of current through the PV module(s) should be provided.

(v) Electronics should have proper temperature compensation for proper charging of the battery throughout the year

7) MECHANICAL COMPONENTS

(i) Metallic frame structure (with corrosion resistance paint) to be fixed on the roof of the house to hold the SPV module(s). 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) A vented metallic/ plastic box with acid proof corrosion resistance paint for housing the storage battery indoors should be provided.

8) 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 (It should stop glowing when the battery is fully charged).

(ii) Components and parts used in solar home systems should conform to the latest BIS specifications, wherever such specifications are available and applicable.

(iii) The complete Solar Home System (including the battery) will be warranted for a period of two years from the date of supply. PV modules used in Solar Home Lighting System must be warranted for their output peak watt capacity, which should not be less than 90% at the end of Twelve (12) 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 supplied. The manufacturers can also provide additional information about the system and conditions of warranty as necessary.

(iv) Necessary lengths of wires/ cables, switches suitable for DC use and fuses should be provided.

(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: