

6) TECHNICAL SPECIFICATION OF SOLAR STREET LIGHTING SYSTEMS

□ DEFINITION:

A stand alone solar photovoltaic street lighting system (SLS) is an outdoor lighting unit used for illuminating a street or an open area. The Solar Street Lighting System consists of solar photovoltaic (SPV) module, a luminaire, storage battery, control electronics, inter-connecting wires/cables, module mounting pole including hardware and battery box. The luminaire is based on Compact Fluorescent Lamp (CFL) which emits light when electric current passes through it. The luminaire is mounted on the pole at a suitable angle to maximize illumination on the ground. The PV module is placed at the top of the pole at an angle facing south so that it receives solar radiation throughout the day, without any shadow falling on it. A battery is placed in a box attached to the pole.

Electricity generated by the PV module charges the battery during the day time which powers the luminaire from dusk to dawn. The system lights at dusk and switches off at dawn automatically.

BROAD PERFORMANCE SPECIFICATIONS

PV Module	74 Wp under STC
Battery	Lead acid Tubular Flooded or Tubular GEL / VRLA , 12V- 75 AH @ C/10
Light Source	Compact Fluorescent Lamp of 11 Watt
Mounting of light	Minimum 4 metre pole mounted
Electronics Efficiency	Minimum 85% total
Inverter	Quasi sine wave or sine wave type
Duty Cycle	Dusk to dawn
Autonomy	3 days or Minimum 42 operating hours per permissible discharge

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(s) under STC should be a minimum of 74 Wp at a load voltage* of 16.4 ± 0.2 V. Either two modules of minimum 37 Wp output each or one module of 74 Wp output should be used.
- iv. The open circuit voltage* of the PV modules under STC should be at least 21.0 Volts.
- v. **The module efficiency should not be less than 14%.**
- vi. The terminal box on the module should have a provision for opening it for replacing the cable, if required.

- vii. **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.**

*The load voltage and Voc conditions of the PV modules are not applicable for the system having MPPT based charge controller

BATTERY

- i. Lead Acid, tubular positive plate flooded electrolyte or Gel / VRLA Type.
- ii. The battery will have a minimum rating of 12V, 75 Ah at C/10 discharge rate.
- iii. 75 % of the rated capacity of the battery should be between fully charged and load cut off conditions.
- iv. Battery should conform to the latest BIS/ International standards.

LIGHT SOURCE

- i. The lamp should be 11 Watt compact fluorescent lamp (CFL) with 4 pins along with proper pre-heating circuit.
- ii. The lamp should be housed in an assembly suitable for outdoor use, with a reflector on its back.

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.

ELECTRONICS

- i. The total electronic efficiency should be at least 85%.
- ii. The inverter should be of quasi sine wave/ sine wave type, with frequency in the range of 20 - 30 KHz.
- iii. Electronics should operate at 12 V and should have temperature compensation for proper charging of the battery throughout the year.
- iv. No load current 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. Fuse 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 temperature compensation for proper charging of the battery throughout the year.
- vi. Adequate protection should be provided against battery reverse polarity.
- vii. 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 to adjust its angle of inclination to the horizontal between 0 and 45, so that the module can be oriented at the specified tilt angle.
- iii. The pole should be made of Galvanised Iron (GI) pipe.
- iv. The height of the pole should be 4 metres above the ground level, after grouting and final installation.
- v. The pole should have the provision to hold the luminaire.
- vi. The lamp housing should be water proof and should be painted with a corrosion resistant paint.
- vii. A vented, acid proof and corrosion resistant metallic box with a locking arrangement for outdoor use should be provided for housing the battery.

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. All the components and parts used in the solar street lighting systems should conform to the latest BIS or IEC specifications, wherever such specifications are available and applicable.
- ii. **The street lighting system including the battery will be warranted for a period of five years from the date of supply.**
- iii. **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.
- iv. 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 and wattage of the CFL 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 trouble shooting 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.