

## TECHNICAL SPECIFICATIONS-SOLAR STREET LIGHT

### GENERAL TECHNICAL SPECIFICATION:

A Solar Street Light (LED based) consist of white LED luminary of maximum 12 Watt ( LED + Driver) as per configuration along with solar PV modules and battery of given capacity, necessary control electronics-inter connecting wires / cables, module mounting structures etc. to operate the load for dusk to dawn. The broad performance specifications of a White Light Emitting Diode (W-LED) light source based solar street lighting system are given below.

### BROAD PERFORMANCE PARAMETERS

PV Module	<b>Only indigenous modules shall be used in the project.</b> SPV module 75 Wp at $16.4 \pm 0.2$ Volt under STC. Module Voc minimum of 21 V.
Battery	Low Maintenance flooded electrolyte Tubular positive plate Lead Acid batteries of capacity 12 V, 75 AH @ C/10,Min DOD 75%
Light Source	<ul style="list-style-type: none"><li>• White Light Emitting Diode (W-LED) 12 Watt( LED +Driver)</li><li>• Using LEDs which emits ultraviolet light will not be permitted</li></ul>
Light Out put	White colour (colour temperature 5500-6500 K). Lumen efficacy of LED- min 120 lumens/Watt @350 mA. The illumination should be uniform without dark bands or abrupt variations, and soothing to the eye. Higher light output will be preferred.
Mounting of light	4 meter above ground, pole Mounted
Average duty cycle	Dusk to dawn

### MINIMUM TECHNICAL REQUIREMENTS / STANDARDS

#### 1. DUTY CYCLE

- The LED solar street lighting system should be designed to operate for dusk to dawn

#### 2. SPV MODULES:

- Only indigenous modules of reputed brand such as BHEL, BEL, CEL, REIL, Tata BP Solar, Vikram Solar, Premier Solar, Waaree Energy or equivalent make (IEC Tested) shall only be used in the project.** Crystalline high power/efficiency cells shall be used in the solar photovoltaic module. The power output of the module shall not be less than 75 Wp at  $16.4 \pm 0.2$  Volt under standard test conditions (STC). The module efficiency should not be less than 14%.
- The open circuit voltage of the PV modules under STC should be at least 21.0 Volts.
- PV module must be warranted for output wattage, which should not be less than 90% at the end of 10 years and 80% at the end of 25 years.
- The terminal box on the module shall be designed for long life out door operation in harsh environment should have a provision for opening for replacing the cable, if required.

- v. The offered module shall be in accordance with the requirements of MNRE.
- vi. Latest edition of IEC 61215 edition II / IS 14286 for Crystalline and shall be certified by MNRE/NABL authorized test center. The bidder shall submit appropriate certificates.
- vii. PV modules must quality to IEC 61730 Part 1- requirements for construction & Part 2 – requirements for testing, for safety qualification.
- viii. Protective devices against surges at the PV module shall be provided. Low voltage drop bypass diodes shall be provided and if required, blocking diode(s) may also be provided.

**ix. IDENTIFICATION AND TRACEABILITY**

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) Name of the Manufacturer of Solar cells
- (iii) Month and year of the manufacture (separately for solar cells and module)
- (iv) Country of origin (separately for solar cells and module)
- (v) I-V curve for the module
- (vi) Peak Wattage,  $I_m$ ,  $V_m$  and FF for the module
- (vii) Unique Serial No and Model No of the module
- (viii) Date and year of obtaining IEC PV module qualification certificate
- (ix) Name of the test lab issuing IEC certificate
- (x) Other relevant information on traceability of solar cells and module as per ISO 9000 series.
- (xi) The RFID should be inside the module laminate,

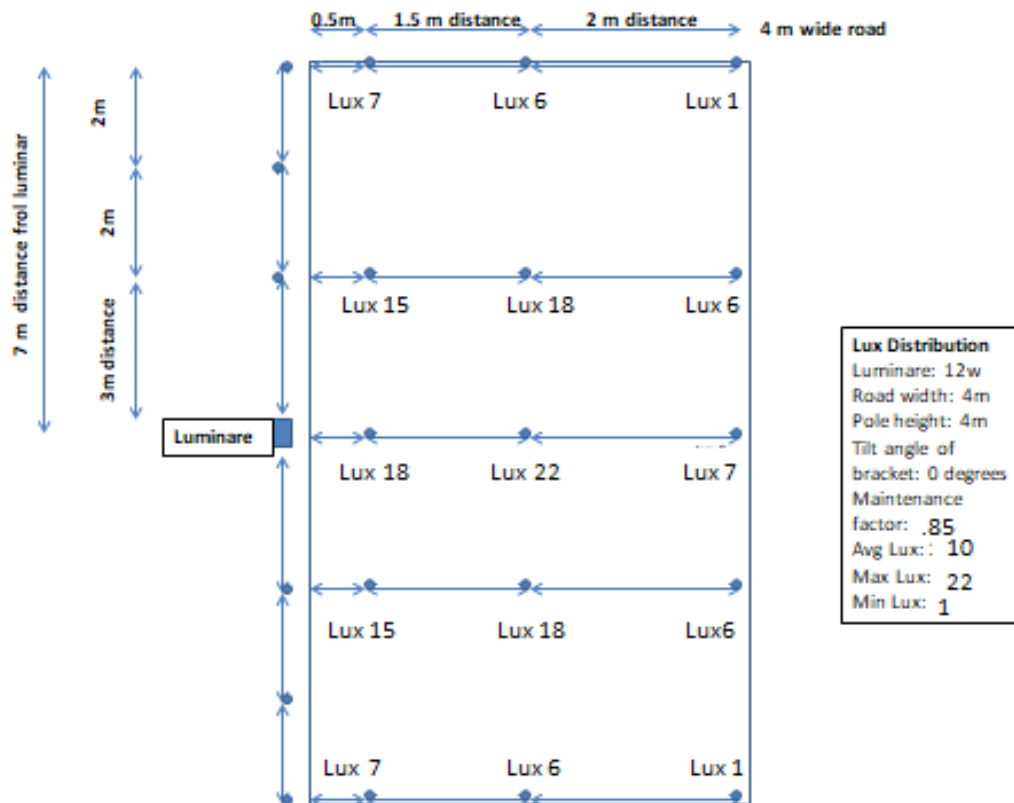
**3. BATTERY**

Battery shall be flooded electrolyte Tubular positive plate Lead Acid, Low Maintenance type with low antimony lead alloy plates and ceramic vent plugs. The batteries should conform to the latest BIS 13369:1992. A copy of the relevant test certificate for the battery should be furnished. The battery of reputed Indian make: Exide, Amco, HBL Power Systems, Luminous, Amar raja, Tata power, Southern Hi-Power battery, Su-Kam or equivalent make (Tested by Central Electro-chemical research laboratory, CECRI, Tamilnadu or authorize test center of MNRE/ NABL test laboratory for relevant BIS 13369:1992 /IEC 61427 standard) shall only be used.

- i. Capacity of the battery shall be not less than 12V, 75 Ah at C10 rate.
- ii. Minimum DOD of battery shall be 75% i.e., at least 75 % of the rated capacity of the battery should be between fully charged & load cut off conditions.
- iii. Battery shall have a design life expectancy of >5 years at 50% DOD at 27°C.
- iv. Battery terminal shall be provided with covers.
- v. Suitable carrying handle shall be provided.
- vi. Bidder shall mention the design cycle life of batteries at 75%, 50% and 25% depth of discharge at ambient temperature up to 55 degree C.
- vii. The batteries shall be designed for operating in ambient temperature of site up to 55 degree C.
- viii. The self discharge of batteries shall be BIS standard.
- ix. Batteries shall be provided with micro porous vent plugs & acid level indicator.
- x. Preferably the battery may be tested for endurance test as per latest BIS standards.

#### 4. LIGHT SOURCE:

- i. The light source will be of white LED type. The color temperature of white LEDs used in the system should be in the range of 5500 degree K – 6500 degree K. Use of LEDs which emits ultraviolet light will not be permitted.
- ii. The illumination should be uniform without dark bands or abrupt variations, and soothing to the eye. Higher light output will be preferred. The light output from the white LED light source should be almost constant.
- iii. The lamps should be housed in an assembly suitable for outdoor use and shall comply to IP 65. The LED housing preferably should be made of pressure die cast aluminum having sufficient area for heat dissipation and heat resistant toughened clear glass/ high quality poly carbonate fitted with pressurized die cast aluminum frame with SS screws. The temperature of heat sink should not increase more than 30 degree C above ambient temperature even after 48 hrs of continuous operation. This condition should be complied for the dusk to dawn operation of the lamps while battery operating at any voltage between the load disconnect and charge regulation set point.
- iv. High power LED of minimum 1 (one) watt each capacity capable to withstand maximum 1 amp driving current having optical lens angle greater than 120 degree shall be used. The LED of CREE/ NICHIA/ OSRAM/ SEOUL SEMICONDUCTOR/ PHILIPS LUMILEDS/ LEDNIUM and LG Make or equivalent make (Having LM 79 and LM 80 test report) shall only be used.
- v. The LED efficacy should be more than 120 lumen / watt @ 350 mA, The total luminaire efficacy should not be less than 100 lumens per watt.( Including all losses) i.e the lumens output of luminaire should not be less than 1200 lumens.
- vi. The lumen depreciation of LED shall not be more than 30% even after 50,000 burning hours.
- vii. Power consumption of the LED Luminaire / Lighting unit shall not be more than 12 W (including LED Driver power loss).
- viii. The luminaire should have Suitable UV Stabilized polycarbonate reflector.
- ix. Luminaires, reflectors and LED's should be engineered in such a way to give the specified lumens out put distributed uniformly.
- x. The luminaire should be designed and manufactured by the reputed Indian brand such as Bajaj, Osram, Philips, GE India, Havells, Crompton Greaves, Syska or equivalent brand and above specifications and tested as per LM-79-08 or latest standard by the MNRE/NABAL accredited lab for such.
- xi. The luminaire should be tested for its 50000 hours operating life as per LM-79 test methodology or other instrumental/BIS Standard. The test report should be from MNRE/ NABL accredited lab.
- xii. The PCB used in luminaires should have lead free-auto soldering and replaceable card type.
- xiii. The firm should have in house test facilities for testing of the luminaire.
- ivx. The system supplied should have minimum 5% spare parts except Panel and Batteries to be kept at service center. Service Center should mandatory be opened before commissioning of systems and at least till warranty period.
- xv. The lux level over a 4 meter wide road should not be less than 5% at the point mentioned below in the lux level distribution chart.



xvi. Other Parameters :

- LED DC current regulation – better than 3 %
  - Input – 12 V DC
  - Driver Type- DC-DC ( as per IEC 62384)
  - CRI > 70 % Typical
  - Lighting quality- Free from glare, flickering and UV
  - Ambient temp– upto 55 deg
  - Total electronics efficiency > =90 %
- xvii. The connecting wires used inside the luminaries, shall be low smoke halogen free, fire retardant e-beam cable and fuse protection shall be provided at input side.
- xviii. Auto resettable reverse polarity protection shall be provided.
- xiv. LED lighting unit shall comply to LM 79-08 and LM 80-08 Standards and copy of test certificate from Authorized lab should be submitted.
- xv. The make, model number, country of origin and technical characteristics of white LEDs used in the lighting system must be furnished.
- xvi. In order make the system performance better and longer life a suitable **micro controller dimmer** may be provided to dim the light about 50% between 12 PM to 4 AM in night.
- xvii. Lux level available from the light source mounted at a height of 4 meter, Across the road width of 4 meter and along the road for 7 meter distance both side from pole with interval of 1 meter shall be submitted. The luminaries must have street light distribution polar curve with more than 36 degree of spread and more than 44 degree of throw. It must have a bat wing distribution pattern & must provide uniform lighting in road application as per IS 1944 road lighting standard. The bidder should submit the polar curve of luminaries along with technical bid.

## 5. ELECTRONICS

- i. Charge controller should be PWM charger type.
- ii. The charge controller shall conform IEC 62093 / IEC 60068 or MNRE standard
- iii. The charge controller shall have
  - Temperature compensated set points for charging
  - PV array disconnect/reconnect points shall be set properly to get the maximum charging battery.
  - Protection against polarity reversal of PV array and battery, Over Current, Short Circuit, Deep Discharge, Input Surge Voltage ; Blocking diode protection against battery night time leakage through PV Module.
- iv. Electronics should operate at 12V and the efficiency of DC-DC converter should be at least 90 %.
- v. The system should have protection against battery overcharge and deep discharge conditions. The numerical values of the cut off limits of lower voltage should not be less than 11.1 Volt.
- vi. Fuses should be provided to protect against short circuit conditions.
- vii. A blocking diode should be provided as part of the electronics, to prevent reverse flow of current through the PV module, in case such a diode is not provided with the PV module.
- viii. Full protection against open circuit, accidental short circuit and reverse polarity should be provided.
- ix. Charge controller shall have automatic dusk-dawn circuit based on spv module as sensor for switching on/off the street light without manual intervention
- x. The self consumption of the charge controller shall not be more than 20 mA at rated voltage and rated current.
- xi. Adequate protection shall also be incorporated under no-load conditions (i.e. when the system is ON & the load (LED Lamp is removed)
- xii. 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.
- xiii. All capacitors shall be rated for max. temp of 105° C.
- xiv. Resistances shall preferably be made of metal film of adequate rating.
- xv. Devices shall have adequate thermal margin at amb. temp. of 55° C
- xvi. Fiber glass epoxy of grade FR 4 or superior shall be used for PCB boards.

### Technical Requirement/Standards

Item / System	Applicable BIS /Equivalent IEC Standard Or MNRE Specifications	
	Standard Description	Standard Number
Solar PV Systems	Crystalline Silicon Terrestrial PV Modules	IEC 61215 / IS14286 Test Certificates / Reports from IECQ / NABL accredited laboratory for relevant IEC / equivalent BIS standard. If IEC certificates are not available for 75 Wp capacity, qualification certificate from IEC / NABL accredited laboratory as per relevant standard for any of the higher wattage regular module shall be furnished. Further, the manufacturer should certify that the supplied module is also manufactured using same material design and process similar to that of certified PV module

Charge Controller and Protections		IEC 62093 Equivalent BIS Std.
Storage Batteries	General Requirements & Methods of Testing Tubular Lead Acid /Capacity Test Charge/Discharge Efficiency Self-Discharge	IS 1651/ IS 13369
Cables	General Test and Measuring Method PVC insulated cables for working voltage up to and including 1100 V UV resistant for outdoor installation	IEC 60189 IS 694/ IS 1554 IS/IEC 69947
Junction Boxes /Enclosures for Inverters/Charge Controllers/Luminaries	General Requirements	IEC 62208 IP 65
LED	Lamps Luminary Cycle life	LM -80-08 LM 79-08

## 6. MECHANICAL HARDWARE

- (i) A metallic frame structure (hot dip galvanized with 35\*35\*3 mm angle) to be fixed on the pole to hold the SPV module(s). The frame structure should be fixed at 30 degree from horizontal facing true south.
- (ii) The pole should be hot dip galvanized (120 microns) GI pipe of 3 mm thickness with min 75 mm diameter of 5 meter length. The pole should have the provision to hold the weather proof lamp housing individually as per case and battery box at appropriate height. SPV panel shall be mounted on pole. The mounting structure shall be fixed in the center of GI tubular pole made flat at fixing end, square angle adjusting plate of 115 mm size 3 mm thick shall be provided. So that SPV panel can be fixed at inclination of 30 degree from horizontal.

(a) The metallic arm for holding the light assembly should be set at a suitable angle to maximize uniform illumination of desired level over the specified area (4 meter wide road). The arm length of luminary holder from pole should be 0.5 meter for its easy approachability for repairing and replacement.

(b) Two 10 mm steal bar of 300 mm length should be inserted at the interval of 25 mm from bottom of the pole.

### vi) BATTERY BOX :

A vented metallic box of 18 SWG thick made of pre coated galvanized MS sheet with 60 microns thickness for housing the storage battery outdoors should be provided with proper lock and key. The boxes should be inscribed with UPNEDA written on at least two faces. The size of box should be as per battery size (including vent plug/level indicator) providing minimum clearance of 40 mm on all sides. The battery box is to be properly rest/mounted on pole above 2.25 meter (bottom level of battery box) above ground with suitable bracket (min. 35\*35\*3 mm angle) and clamp ( hot dip galvanized min 10 mm dia ). Louvers for proper ventilation should be provided on one side and back

of the battery box. No vent shall be providing on top of battery box. Box should be provided with proper lock & locking arrangement. The edges of box should be turned properly to give smooth edge and good strength. Two wooden battens should be fixed inside the battery box to avoid the electrical contact between battery and box. Components and hardware shall be vandal and theft resistant. All parts shall be corrosion- resistant.

vii) ELECTRIC CABLE

The electric cable used shall be twin core PVC insulated water and UV resistance copper cable of minimum size 1.5 mm. Cable shall meet IS 1554 / 694 Part 1:1988 & shall be of 650 V/ 1.1 kV

7. OTHER FEATURES

A toll free number (i.e. 1800 180 0005) of IVRS of UPNEDA and 14 digit UID number of minimum thickness 5mm and height of letter should be at least 25mm (issued/provided by UPNEDA) is to be embossed / punch/ nut-bolted strip on pole between 1-1.5 meter above from ground level and in front of battery box by contractor/ bidder, which in case of non-working/ operational problems etc of system will be dialed by the beneficiary etc to lodge a complaint in respect of system problems. The IVRS will divert the complaint to Contractor/ bidder through e-mail, SMS etc. The contractor/ bidder will have to rectify the same to make/ restore the system to working position within 72 hours in the warrantee period of 5 years, failing which the system may be get rectified on contractor/ bidder cost and the cost will be recovered by contractor/ bidders pending claims what so ever and appropriate action as per non compliance etc of agreement will be considered / taken.

8. INSTALLATION OF SYSTEM:

The system should be properly installed at site. The SPV module mounting structure along with pole should be properly grouted depending upon the location and requirement of the site. The grouting should be such that it should withstand the maximum wind speed /storm. The pole should be grouted with CC mixture of 1:2:4 of dia 350 mm having depth of 1000 mm and 200 mm above ground level with 300 mm dia. Adequate space should be provided behind the PV module/array for allowing un-obstructed air flow for passive cooling. Cables of appropriate size should be used to keep electrical losses to a bare minimum. Care should be taken to ensure that the battery is placed with appropriate leveling on a structurally sound surface. The control electronics should not be installed directly above the battery. All wiring should be in a proper conduit or capping case. Wire should not be hanging loose. Any minor items which are not specifically included in the scope of supply but required for proper installation and efficient operation of the SPV systems, is to be provided by the manufacturer as per standards.

## EMPANELLED FIRMS AND RATES FOR 2017-18

Supply, installation, commissioning and 5 years Warranty with comprehensive maintenance of Complete Solar Street Lighting (W-LED) System at identified sites of Uttar Pradesh, FOR site.

SN O.	NAME OF FIRM	ADDRESS AND EMAIL	CONT. PERSON & MOB. NO.	APPROVED RATE
1.	M/s Lord's Mark Industries Pvt. Ltd,	B-101, Riddhi Siddhi Comple M.G.Road, Borivali (E), Mumbai-400 066. lordsmarksales@gmail.com	MR. DINESH TIWARI, DIRECTOR, 07977790717	21400/-
2.	M/s Jain Irrigation Systems Ltd.,	Jain Plastic Park, N.H. No. 6,P.O. Box 72, Jalgaon- 425001. jisl@jains.com	MR.ANUPA M LAL, 9453007807	21400/-
3.	M/S Easy Photovoltech Pvt. Ltd.	"Solar Cottage" Delhi-Me Road,DUHAI, Ghaziabad, UP - 201206 nrpower@gmail.com	MR.VINOD KUMAR SHARMA, DIRECTOR, 09311112551	21400/-
4.	M/s Gautam Solar Private Ltd,	Plot No- F-33, Okhla Indus Area, Phase1,New Delhi- 110020 ashish@gautampolymers. com	MR. ASHISH SHARMA, AGM, 09310141995	21400/-