Annexure IV

SOLAR DOMESTIC LIGHT - Technical Specifications

There are two models of LED based Solar Domestic Lights with the following minimum rated parameters.

1. Solar Domestic Light- Model A

LED	4 W, 600 lumen
Solar PV Module (Poly/Mono Crystalline Silicon)	10 Wp
Battery (Lithium Ferro Phosphate)	12.8 V, 6 Ah (76.8 Wh)
Autonomy of operation	12 hours

2. **Solar Domestic Light- Model B**

LED	6 W, 900 lumen
Solar PV Module (Poly/Mono Crystalline Silicon)	12 Wp
Battery (Lithium Ferro Phosphate)	12.8 V, 6 Ah (76.8 Wh)
Autonomy of operation	9 hours

A Solar Domestic Light is a portable lighting device consisting of a PV module, battery, LED lamp and electronics. Battery, lamp, optics and electronics are placed in a suitable housing, made of metal or plastic or fiber glass. The Solar Domestic Light is suitable for covering a full range of 360 degrees lumen output.

PV module converts sun light into electricity, charges the battery which powers the luminaire. Luminaire consists of White Light Emitting Diode (W-LED), a solid state device which emits light when an electric current passes through it.

White LED of 150 lumen/watt efficacy (as per LM- 80 certificate), LED with dispersed beam, soothing to eyes without dark patches with the use of proper dome shaped reflector (Preferable) are the features of the lantern. Optical diffuser should not be used for reducing luminous intensity.

Facility for mobile phone charging: USB port for mobile charging to be provided. Duty cycle for lighting will be adjusted accordingly.

I.H.2 PV MODULE

(i) Indigenously manufactured PV modules should be used in the solar domestic light.

(ii) **The PV module should have crystalline silicon solar cells, and should have a test certificate conforming to IEC 61215** Edition II / BIS 14286 from an NABL or IECQ accredited Laboratory. In case the certificate for the offered module is not available, a

test certificate for higher capacity module of same make and series produced by the same PV module manufacturer should be available. Test certificate should be submitted with tender.

(iii) The PV module must have a minimum of 10 / 12Wp at a load voltage* of 16.40 V under the standard test conditions (STC) of measurement.

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

(v) The module efficiency should be above 14%**.**

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

(vii) There should preferably be an arrangement (stand) for mounting the module at an optimum angle in the direction facing the sun.

(viii) A foil/ strip containing the following details should be fixed inside the module so as to be clearly visible from the front side:-

a) Name of the Manufacturer and/ or distinctive Logo
b) Model and/ or Type No.
c) Serial No.
d) Year of manufacture

(ix) The cable connecting module to the lantern should be good quality 2 core, 1 sq. mm double sheathed copper cable suitable for outdoor use and having a length of minimum 12 meters.

***The load and open circuit voltage conditions of the PV module are not applicable for the system having MPPT.*

I.H.3 BATTERY

(i) Minimum 76.8 Wh capacity), Lithium Ferro Phosphate battery **(IEC 62133 or BIS test certificate should be submitted with the document)**

I.H.4 LIGHT SOURCE

i. The light source will be of White Light Emitting Diode (W-LED) type, minimum luminous efficacy 150 Lumen/watt.

ii. The colour temperature of W-LED(s) used in the system should be in the range of 5000^{o}K –6500^{o}K.

iii. W-LED(s) should not emit ultra violet light.

iv. The light output from the W - LED should be constant throughout the duty cycle.

v. LM 80 test certificate of the LED should be submitted with the document.

vi. Test certificate of the solar domestic light issued from laboratories authorised by MNRE / NABL / IEC to be provided along with submission of bid for compliance of the electrical/ electronic parameters. The test certificate should clearly indicate the make and model of the test sample of solar domestic light and the make and model number of the LED used in the lantern.

I.H.5 ELECTRONICS

(i) Efficiency of the electronic system should be at least 85%.
(ii) Electronics should have temperature compensation for proper charging of the battery throughout the year.
(iii) The idle current should be less than 1 mA
(iv) The PCB containing the electronics should be capable of solder free installation and replacement.
(v) Necessary switches suitable for DC use and other protections should be provided.
(vi) The system should have a USB port for mobile phone charging facility.
(vii) A dual sheathed 2 core copper cable of 1 sq.mm and minimum length of 12 metre should be provided for inter-connection between the module and the lantern.

I.H.6 ELECTRONIC PROTECTIONS

(i) Adequate protection is to be incorporated for "No Load" condition, e.g. when the lamp is removed and the lantern is switched ON.
(ii) The system should have protection against battery overcharge and deep discharge conditions.
(iii) The load reconnect should be provided at above 70% of the battery capacity status.
(iv) Adequate protection should be provided against battery reverse polarity.
(v) A fuse should be provided to protect against short circuit conditions.
(vi) Protection for avoiding reverse flow of current through the PV module should be provided.
(vii) During the charging, lamp cannot be switched "ON".

I.H.7 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

I.H.8 QUALITY AND WARRANTY

(i) The solar domestic light unit with W-LED including battery will be warranted for five years. The PV module should be warranted for 10 years.
(ii) The Warranty/ Guarantee Card to be supplied with the Solar Domestic Light must contain the details of the system supplied.

I.H.9 OTHER FEATURES

An Operation, Instruction and Maintenance Manual, in English and Malayalam, should be provided with the Solar Domestic Light. The following minimum details must be

provided in the Manual:

a. Basic principles of photo voltaics.
b. A small write-up (with a block diagram) on Solar Domestic Lights - its components, PV module, battery, electronics and luminaire and expected performance.
c. Significance of indicators.
d. Type, Model number, Voltage, capacity of the battery, used in the system.
e. The make, model number, country of origin and technical characteristics (including IESNA LM-80 report) of W -LEDs used in the lighting system.
f. Clear instructions on mounting, operation, regular maintenance and troubleshooting of the Solar Domestic Light.
g. Instructions on replacement of battery.
h. DO's and DONT's.
i. Name and address of the contact person for repair and maintenance during the warranty.