



Rural Electrification Corporation Limited
(A Government of India Enterprise)

Registered Office: Core-4, SCOPE Complex, 7, Lodhi Road, New Delhi-110003

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To
All Implementing Agencies/ REC Project Offices

Sub: Models of Standalone systems in DDG under DDUGJY

Dear Sir

Monitoring Committee in its last meeting dated 02.09.2015 has approved few amendments in DDG guidelines i.e. if cost of electrification per HH in a village is more than 1 lakh or the no. of HHs in the village/Habitation is less than 15, the village may be electrified through stand-alone system. Following two models have been approved by Monitoring Committee for standalone systems:-

- **SOLAR POWER PACK - Model I (with a D.C. Fan):** The System consists of 200 Wp SPV Module, Lithium Ferro phosphate Battery (approx.. 1000 Watt hours). The system would cater to the Load of 5 Nos. of LED(max. 7.0 Watts each), 1 D.C. Fan (20Watts), 25 watt DC power plug, provision for Mobile Phone Charging etc for 5-6 hrs a day.
- **SOLAR POWER PACK - Model II (without D.C. Fan):** The System consists of 200 Wp SPV Module, Lithium Ferro phosphate Battery (approx.. 1000 Watt hours). The system would cater to the Load of 6 (5 + 1) Nos. of LED(max. 7.0 Watts each), 25 watt DC power plug, provision for Mobile Phone Charging etc for 5-6 hrs a day.

The broad Technical Specifications of the equipment to be used in above models are annexed.

For common facilities viz. Panchayat Bhawan, school etc above standalone system shall be used. Further, street lighting (6 watt LED) through stand-alone system shall also be provided (one street light in 5 HHs). Suppliers will have to supply, install, commission & maintain the system for 5 years. Online Monitoring shall also be conducted through mobile phone sms (feature to be built in). The exact requirement of standalone module shall be governed by specific site conditionality. In cases, where adequate sunshine is not feasible, panel with higher capacity or micro hybrid (solar + wind) system shall be permitted. This is for the information and necessary action please.

Thanking you

Yours faithfully



(Neeraj Sharma)
Dy. Manager (DDG)

WHITE LED (W-LED) BASED SOLAR BASED HOME SYSTEMS (SOLAR POWER PACKS)

A solar home system (SHS) provides a comfortable level of illumination in one or more rooms of a house. The SHS consists of a PV module, control electronics, battery, and luminaire(s). There are two SHS models featuring 5 numbers of luminaires based on White Light Emitting Diode (W-LED). The Systems could be used to run a small DC fan and / or a 12-V DC television along with the W-LED Lamps.

SOLAR POWER PACK - Model I (with a D.C. Fan)

The System consists of:

- SPV Module (with Module Mounting Structure) :200 Wp
- Battery: 12.8 Volts, 75 Ahr. (approx.. 1000 Watt hours) **Lithium Ferro phosphate**
- Solar Charge Controller with MPPT to appropriately charge and protect the battery against overcharge.
- Load :
 - 5 Nos. of White Light Emitting Diode (W-LED) Luminaire (max. 7.0 Watts each) for 5-6 Hrs. / day
 - 1 D.C. Fan(20Watts) for 5-6 Hrs. / day
 - Power for a 12V DC TV (max. 25 watts) set, to be purchased separately (Optional) for 5-6 hrs. / day
 - Provision for Mobile Phone Charging

SOLAR POWER PACK - Model II (without D.C. Fan)

The System consists of:

- SPV Module (with Module Mounting Structure) :200Wp
- Battery: 12.8 Volts, 75 Ahr. (approx.. 1000 Watt hours) **Lithium Ferro phosphate**

- Solar Charge Controller with MPPT to appropriately charge and protect the battery against overcharge.
- Load :
 - 5 Nos. of White Light Emitting Diode (W-LED) Luminaire (max. 7.0 Watts each) for 5-6 Hrs. / day
 - Additional one No. of White Light Emitting Diode (W-LED) Luminaire (max. 7.0 Watts) for 5-6 Hrs. / day
 - Power for a 12V DC TV (max. 25 watts) set, to be purchased separately (Optional) for 5-6 hrs. / day
 - Provision for Mobile Phone Charging

TECHNICAL DETAILS

PV MODULE (S)

- i. Indigenously manufactured PV modules should be used
- ii. The PV modules should be made up of 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 module efficiency should not be less than 14%.**
- iv. The terminal box on the module should have a provision for opening, for replacing the cable, if required.
- v. There should be a Name Plate fixed inside the module which will give:
 - a. Name of the Manufacturer or Distinctive Logo.
 - b. Model Number
 - c. Serial Number
 - d. Year of manufacture
- vi. 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.

BATTERY

- (i) **Lithium Ferro phosphate type battery only.**
- (ii) Capacity approx. 1000 Watt Hour
- (iii) Maximum Depth of Discharge 90%
- (iv) Battery should conform to the latest BIS/ International standards.

LIGHT SOURCE

- (i) Two light sources shall be with 7.0 Watts of white LED and Light Output should be Minimum 25 Lux when measured at the periphery of 2.5 meter diameter from a height of 2.5 meter

- (ii) At any point within area of 2.5mtr diameter periphery the light level should not be more than three times of the periphery value.
- (iii) The illumination should be uniform without Dark Bands or abrupt variations and soothing to the eyes. Higher output would be preferred.
- (iv) The colour temperature of W-LEDs used in the system should be in the range of 5500°K–6500°K.
- (v) LEDs should not emit ultraviolet light.
- (vi) The light output from the W-LED light source should be constant throughout the duty cycle.
- (vii) The lamps should be housed in an assembly suitable for indoor use.

ELECTRONICS

- (i) The total electronic efficiency 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 2 mA.
- (iv) The voltage drop from module terminals to the battery terminals should not exceed 0.6 volts including the drop across the diode and the cable when measured at maximum charging current.
- (v) The PCB containing the electronics should be capable of solder free installation and replacement.
- (vi) 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" condition.
- (ii) The system should have protection against battery overcharge, deep discharge condition.
- (iii) Load reconnect should be provided at 80% of the battery capacity status.
- (iv) Adequate protection should be provided against battery reverse polarity.
- (v) Fuses should be provided to protect against short circuit conditions.
- (vi) Protection for reverse flow of current through the PV module(s) should be provided.

MECHANICAL COMPONENTS

- (i) Corrosion resistant frame structure should be provided to hold the SPV module.
- (ii) The frame structure should have provision to adjust its angle of inclination to the horizontal, so that it can be installed at the specified tilt angle.
- (iii) Light source should be either for wall mounted or ceiling mounted or can be hung from the ceiling in a stable manner, as per site requirements.
- (iv) A vented plastic/ wooden/ metallic box with acid proof corrosion resistant paint for housing the storage battery indoors should be provided.

INDICATORS

- (i) The system should have two indicators, green and red.
- (ii) 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.
- (iii) Red indicator should indicate the battery "Load Cut Off" condition

QUALITY AND WARRANTY

- (i) **The Solar home system including Battery will be warranted for a period of five years from the date of supply.**
- (ii) **The PV module(s) will be warranted for a minimum period of 25 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 Ten (10) years and 80% at the end of Twenty five (25) years.
- (iii) The Warranty Card to be supplied with the system must contain the details of the system. The manufacturers can also provide additional information about the system and conditions of warranty as necessary.

OPERATION and MAINTENANCE MANUAL

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:

- (i) Basic principles of Photovoltaics.
- (ii) A small write-up (with a block diagram) on Solar Home Lighting System - its components, PV module, battery, electronics and luminaire and expected performance.
- (iii) Significance of indicators.
- (iv) Type, Model number, voltage & capacity of the battery, used in the system.
- (v) The make, model number, country of origin and technical characteristics (including IESNA LM-80 report) of W-LEDs used in the lighting system must be indicated in the manual.
- (vi) Clear instructions about mounting of PV module(s).
- (vii) Clear instructions on regular maintenance and trouble shooting of the Solar Home Lighting System.
- (viii) DO's and DONT's.
- (ix) Name and address of the contact person for repair and maintenance.

WHITE-LED (W-LED) BASED SOLAR STREET LIGHTING SYSTEM

Using Lithium Batteries

A standalone solar photovoltaic **Street lighting** system (SLS) is a lighting unit used for illuminating 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 White Light Emitting Diode (W-LED), a solid state device 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

The broad performance specifications of a W-LED light source based Solar Street Lighting System are given below:

PV Module	40Wp under STC
Battery	Minimum 200 Watt Hour (Lithium Ferro phosphate)
Light Source	7 Watt (Max.) , W-LED luminaire, dispersed beam, soothing to eyes with the use of proper optics and diffuser
Light Output	Multiple Light levels:

The lamp should have two levels of light to take care of different lighting needs during the night.

PV Module	40 Wp under STC
Battery	Minimum 200 Watt Hour (Lithium Ferro phosphate)
Light Source	White Light Emitting Diode (W-LED)
Light Out put	<ul style="list-style-type: none">• Minimum 16 Lux when measured at the periphery of 4 meter diameter from a height of 4 meter (at "High" illumination level). The illumination should be uniform without dark bands or abrupt variations.• Minimum 8 lux at lower illumination level <p>(Higher light output will be preferred)</p>

Lumen o/p	800 Lumens (at 100% light Level)
Mounting of light	5 meters pole mounted
Electronics Efficiency	Minimum 90% total
Duty Cycle	Dusk to dawn 4 Hours full light , 8 hours lower light level with motion sensor

TECHNICAL DETAILS

PV MODULE

- i. Indigenously manufactured PV modules 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 under STC should be a minimum of 37Wp .
- iv. The Load voltage* should be appropriate for charging of battery used, under the standard test conditions (STC) of measurement.
- v. **The module efficiency should not be less than 14 %.**
- vi. The terminal box on the module should have a provision for opening, for replacing the cable, if required.
- vii. There should be a Name Plate fixed inside the module which will give:
 - a. Name of the Manufacturer or Distinctive Logo.
 - b. Model Number
 - c. Serial Number
 - d. Year of manufacture
- viii. 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 conditions of the PV modules are not applicable for the system having MPPT.

BATTERY

- (i) **200 Watt Hour Capacity.**
- (ii) **Lithium Ferro phosphate.**
- (iii) Maximum Depth of Discharge 90%.
- (iv) Battery should conform to the latest BIS/ International standards.

LIGHT SOURCE

- (i) The light source will be of white LED type.
- (ii) The color temperature of W-LEDs used in the system should be in the range of 5500°K–6500°K.
- (iii) LEDs should not emit ultraviolet light.
- (iv) The light output from the W-LED light source should be constant throughout the duty cycle.
- (v) The lamps should be housed in an assembly suitable for outdoor use.

ELECTRONICS

- (i) The total electronic efficiency should be at least 85 %.
- (ii) The idle current should be less than 1 mA.
- (iii) The voltage drop from module terminals to the battery terminals should not exceed 0.6 volts including the drop across the diode and the cable when measured at maximum charging current.
- (iv) The PCB containing the electronics should be capable of solder free installation and replacement.

ELECTRONIC PROTECTIONS

- (i) The system should have protection against battery overcharge, deep discharge condition.
- (ii) Adequate protection should be provided against battery reverse polarity.
- (iii) Fuses should be provided to protect against short circuit conditions. Fuse is not mandatory, in case, over current protection is provided in the driver circuit.
- (iv) Protection for reverse flow of current through the PV module(s) should be provided.

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 Luminaire housing should be water proof (IP 65) and should be painted with a corrosion resistant paint and should be housing the battery.**

INDICATORS

- (i) The system should have two indicators, green and red.
(ii) 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.
(iii) Red indicator should indicate the battery "Load Cut Off" condition

QUALITY AND WARRANTY

- (i) **The complete Solar Street Lighting System (including battery) will be warranted for a period of Five years from the date of supply.**
- (ii) **The PV module(s) will be warranted for a minimum period of 25 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 Ten (10) years and 80% at the end of Twenty five (25) years.
- (iii) The Warranty Card to be supplied with the system must contain the details of the system. The manufacturers can also provide additional information about the system and conditions of warranty as necessary.

OPERATION and MAINTENANCE MANUAL

An Operation, Instruction and Maintenance Manual, in English and the local language, should be provided with the Solar Home 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 Home Lighting System - its components, PV module, battery, electronics and luminaire and expected performance.
- Significance of indicators.
- Type, Model number, voltage & capacity of the battery, used in the system.
- The make, model number, country of origin and technical characteristics (including IESNA LM-80 report) of W-LEDs used in the lighting system must be indicated in the manual.
- Clear instructions about mounting of PV module(s).
- Clear instructions on regular maintenance and trouble shooting of the Solar Home Lighting System.
- DO's and DONT's.
- Name and address of the contact person for repair and maintenance.