

# Technical Specifications for Solar Home System (SHS)

Rural Electrification and Renewable Energy  
Development (PV Component) Project  
(REREDP)

Technical Standards Committee

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**Subject: Report on Technical Specifications for Solar Home System (SHS)**

Dear Sirs:

Here is the report on technical specifications for solar home system (SHS). As you are aware that TSC was formed with the view to proposing technical specifications for photo-voltaic modules and other SHS components to be promoted under International Development Association and Global Environment Facility (GEF) funded Rural Electrification and Renewable Energy Development (PV Component) Project (REREDP).

While setting the specifications, the Committee reviewed similar specifications that have been adopted in other countries and took the country specific, e.g., Bangladesh conditions in account. It believes the specifications formulated are adequate to successfully promote and popularize SHS in Bangladesh.

Should you require any clarification on this report, please do not hesitate to contact me.

Best regards.

Sincerely yours,

Dr. M. Rezwan Khan  
Chairman, TSC

## Preamble

The purpose of this report is to set forth technical specifications for photo-voltaic modules and other solar home system (SHS) equipment promoted under International Development Association and Global Environment Facility (GEF) funded Rural Electrification and Renewable Energy Development (PV Component) Project (REREDP).

The RERED project was planned to be implemented in two phases: the Pilot phase (April-October, 2002) and the main phase (October 2002-October 2008). The Project follows a twin-track approach. The two executing agencies, Infrastructure Development Company Limited (IDCOL) and Rural Electrification Board (REB), are implementing their “Ownership/Direct Sales” and “Fee-for-Service” models, respectively.

SHS components those qualify under this technical specification will be eligible for procurement of this project. Because of difference in delivery mechanism of REB and IDCOL, they will follow their own tendering, evaluation and procurement procedure.

The standard specification will be revised and updated by the Technical Standard Committee during the implementation period of the Project as new technology and products emerge.

# Technical Standards for Solar Home System in Bangladesh

## 1. Solar Home System Hardware Description

- 1.1 The Solar Home System (SHS) is intended to provide the user with a convenient means of supplying power for small electrical loads such as lights, radio/cassette players or TV. A typical SHS operates at a rated voltage of 12 Vdc and provides power for fluorescent luminaries, radio/cassette players, small black and white TV or similar low-power appliance for about three to five hours a day. Additionally, other types of luminaries, 12 Vdc or lower voltage DC/DC converter outlets or a DC/AC inverter may be supplied as options. Each SHS consists of one or more photovoltaic (PV) modules, each having minimum output of 30 Wp charging a 12 Vdc lead-acid battery along with luminaries, related electronic and electrical components and mounting hardware.
- 1.2 The system should be designed to have at least three days autonomy (i.e. can run for three consecutive days without charging from the panel).
- 1.3 The SHS is packaged to provide convenient installation at a remote customer home site by a qualified technician. The system is constructed such that a user can perform routine maintenance such as adding battery water and replacing light bulbs and fuses, and a technician can easily perform system diagnostics or replace components.

## 2. Certification Requirements

- 2.1 Products to be financed by the IDA and Global Environment Facility (GEF) under Rural Electrification and Renewable Energy Development (PV Component) Project (REREDP) must have a type-test certificate from an accredited testing and certification organization as elaborated in Annex-1. For local products, a certification from a reputed institution like Bangladesh University of Engineering and Technology, Dhaka, is acceptable. In case the purchasing authority feels they may ask for sample test of any component from Bangladesh University of Engineering and Technology, Dhaka or any other reputed institution.
- 2.2 The supplier provides the most appropriate system integration, components, assembly and packaging that meet all the component specifications in Annex-1: Solar Home System Component Specifications' and the 'Recommended Practices' described below.

## 3. Recommended Practices

This section provides a minimum set of requirements that shall be followed in the design, specification and installation of the qualified SHS. They form a set of “Recommended Practices” which when followed will ensure adequate levels of safety, performance, reliability and system lifetime.

## 4. PV Module Installation

PV module installation refers to the following:

- (a). If more than one module is used, identical models shall be used and they shall be connected in parallel.
- (b). For SHS installed permanently on a structure (in contrast with portable units):
  - i.* The modules must ensure waterproof sealing for the solar cells. Modules must be framed in such a way as to allow secure connection to the module mounting structure.
  - ii.* The mounting structure will hold the photovoltaic module(s). The module(s) must be mounted on a support structure made of corrosion resistant material that assures stable and secure attachment.
  - iii.* The PV array and support structure must be able to withstand wind gusts up to 160 km/hour without damage.
  - iv.* The structure must be mounted at a fixed angle and oriented to maximize the useful energy supplied to the user over the year (for Bangladesh, the panel should be facing south with a tilt angle of around 23° with the horizon).
  - v.* The structure will incorporate corrosion resistant hardware for all external connections.
  - vi.* The modules can be roof or ground-mounted: In case of Roof-mounted modules, minimum clearance between the PV module and the roofing material must be at least 20 cm above the roofing material. It is recommended that the module mounting structure be supported on top of a pole of at least 50 cm length. Anchoring of the mounting structure must be to the building and not to the roofing material. For ground-mounted modules, a metal, concrete or treated wood pole must be used with the modules attached at the top of the pole. The modules must be at least 4 meters off the ground. The pole must be anchored in concrete or tightly packed soil at least one meter deep in the ground. The pole and mounting structure must be sufficiently rigid to prevent twisting in the wind or if large birds alight on the module.

The panel should be mounted clear of vegetation, trees and structure so as to assure that they are free of shadow throughout day light hours during each season of the year. Furthermore, if more than one panel is mounted on a support structure the panels should not be mounted such that one panel will not shade the other module(s).

## 5. Circuit Protection and Charge Controls

Circuit protection and charge controls include the following:

- (a). Systems must include a means to protect users and system components from the following:
  - i.* Battery overcharge and excessive water loss.
  - ii.* Battery undercharge and excessive discharge.
  - iii.* Circuit protection against short circuit of any load.
  - iv.* Circuit protection against reverse polarity of module or battery.

- v. Circuit protection against internal shorts in charge controller, inverter or other devices.
  - vi. Circuit protection against damage by the high PV open circuit voltage when it is connected to the controller without battery.
  - vii. Night time discharge of the battery due to reverse current through the module.
- (b). Systems will provide appropriate protection by a charge controller incorporating a high voltage disconnect (HVD), low voltage disconnect (LVD) and circuit protection.

## **6. System Monitoring**

System monitoring includes the following:

- (a). A display to indicate when the battery is in the charging mode must be provided.
- (b). This device must, at a minimum, indicate when the battery condition is:
  - i. Suitable to operate loads
  - ii. Energy conservation required
- (c). The chosen device must come appropriately labeled such that the user does not have to refer to a manual to understand the existing battery condition.

## **7. Batteries**

Recommended practices for batteries include the following:

- (a). Batteries should be selected to offer at least five years of useful life.
- (b). The minimum size of the battery should be 50Ah@10 hours.
- (c). The batteries can be supplied in a dry-charged condition and all chemicals and electrolyte must be supplied in accordance with battery supplier specifications. The battery and associated containers should be packaged to handle transport down rough roads.

## **8. Equipment Enclosure**

With regard to equipment enclosure, recommended practices comprise the following:

- (a). The batteries and charge controller should be kept in properly designed protective enclosures.
- (b). The batteries must be housed in a vented compartment. All parts of the compartment subject to battery acid contact must be acid resistant. This compartment must be built strong enough to accommodate the weight of the battery. This compartment must adequately support and vent wet lead-acid batteries. Access to the battery compartment by children must be prevented.

## **9. Wiring**

Wiring practices include the following:



























