

**REPUBLIC OF RWANDA**



**MINISTRY OF INFRASTRUCTURE**

**Ministerial Guidelines on Minimum  
Standards Requirements for Solar Home  
Systems**

**June, 2019.**

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## **PREFACE**

The Rural Electrification Strategy was approved on 27<sup>th</sup> April 2016 by the cabinet, where households will be provided access to modern energy services using systems ranging from stand- alone off-grid home systems to grid connection passing through mini-grids.

For proper implementation of this strategy, to ensure the end-user and Private sector are protected, stand-alone off-grid solar home systems need minimum standard requirements of products participating in this programme.

This document is written to act only as a guide to the relevant standards that should be consulted in importation, design and installation of off-grid renewable energy systems, namely stand-alone power systems utilizing photovoltaic. Information is provided to help identify the relevant clauses in relevant standards in Rwanda. This guide does not attempt to provide reference to all relevant clauses and all considerations as this is the purpose of the standards in their totality. This guide does not in any way replace the standards or relevant training in the design and installation of these systems.

From time to time the standards will be revised and references made in this guide to relevant clauses in the standards may cease to point to the correct clause. Additional clauses may be added that are relevant and clauses deleted.

All those designing, installing and working with the relevant systems should have access to the associated standards and familiarize themselves with the requirements in detail.

## CHAPTER ONE: GENERAL PROVISIONS

### Article 1: Objectives

The objectives of these Ministerial guidelines on minimum standards requirements for solar home systems are to clearly describe the minimum requirements to be fulfilled by a stand-alone solar power system to ensure Quality and Reliability services to the beneficiaries. This document has been written primarily for practitioners in the small scale renewable energy industry who are involved in the business of installing stand-alone systems in Rwanda.

This document is written to act as a guide to the relevant standards that should be consulted in the design and installation of these systems. Information is provided to help identify the relevant clauses in the standards. This document does not in any way replace the existing standards for the design and installation of these systems.

### Article 2: Scope

These Guidelines provide the Minimum Standard Requirements for stand-alone photovoltaic power systems for the implementation of the Rural Electrification Programme, they define the minimum service level energy requirements for an off grid solar home system to be considered under rural electrification in Rwanda as established in Rural Electrification Strategy. Additionally, they cover the corresponding minimum requirements for the off grid solar home system accessories such as Lamps, Cables, Batteries, Solar Photovoltaic Panel, Charge Controller, installation requirements and other Accessories required for off-grid solar home system installation to ensure safety of end users and quality of the system as well as quality of service.

### Article 3: Definitions

Unless the context otherwise requires, the terms used in these guidelines shall have the following meaning:

1. **Power Utility:** is an electric power company that owns and operates equipment and facilities for transmission and distribution of electric energy which it sells to consumers.
2. **Solar Home System (SHS):** are stand-alone photovoltaic systems that offer a cost-effective mode of supplying comfortable power for lighting and appliances to off-grid households in Rwanda. In urban and rural areas, which are not connected to the grid, SHS can be used to meet a household's energy

demand fulfilling its basic electricity needs. For the purposes of this document, solar home systems are defined to be off-grid solar photovoltaic systems that include multiple light points (i.e., two or more). Single light off-grid solar systems are not considered to be solar home systems.

3. **Access to Electricity:** In accordance with the National Rural Electrification Strategy, access to electricity in Rwanda is considered only if a household has enough electricity to provide lighting (at least 3 lamps for each house) phone and radio charging services. The Minimum Service level is fully defined in article 5.
4. **Rural Electrification Programme:** Refers to a set of public policies and programs by the Government of Rwanda to increase the electricity access in rural areas in accordance with the Minimum Service level and System Performance requirements set forth in this document.
5. **Electrical Installation:** Electrical Installation” means a photovoltaic system, in or on any premises, that is used for the generation and transmission of electrical energy from a point of control to a point of consumption anywhere on the premises, including any equipment that forms part of such an installation, irrespective of whether or not it is part of the electrical circuit.

## CHAPTER TWO: PRODUCT SPECIFICATIONS

### Article 4: Quality requirements

Quality standards, warranty requirements, and performance targets are used to interpret the measurements and observations made about a product. Together they form a product specification.

The Institution in charge of Standards shall ensure that products of the Solar Home systems comply with the requirements of RS IEC/TS 62257-9-5, RS IEC/TS 62257-12-1, RS IEC 62124, RS IEC 61215, RS IEC 62093, RS IEC 62509, RS IEC 61951, RS IES 60896 and RS IEC 61960 and shall be accompanied by a proof of conformity to the standards mentioned above from accredited body and recognized under IEC Conformity Assessment and / or Lighting Global.

This table specifies which standards are applied to different system types.

No.	Corresponding Equipment	Standard (Test method and Minimum requirement)
1	Quality requirements for equipment less than 350 W	RS IEC/TS 62257-9-5 Lighting Global Pico PV Quality Standards LG Solar Home System Kit Quality Standard
2	Component based Solar Home system	RS IEC 61215 (PV Module) RS IEC/TS 62257-12-1 (Lamps) RS IES 60896 (Lead Acid Battery) RS IEC 61960 (Lithium Batteries) RS IEC 61951-2 (Nickel Metal Hydride Batteries) RS IEC 62509 (for Charge Controllers) RS IEC 62109-1 and RS IEC 62109-2 (PV Inverters reliability test) RS IEC 62124 (Stand Alone System Design Verification)

The Test Certificate result shall include but not limited to the following information.

No	Technical requirement
1	<b>LED Lamps</b>
1.1	Number of lumens per lamp
1.2	Input voltage
1.3	Color Rendering Index
1.4	Power Consumption
1.5	Warranty Period
2	<b>Solar PV modules</b>
2.1	Cell type
2.2	Number of cells
2.3	Maximum Power Rating (Pmax)
2.4	Open Circuit Voltage (Voc)
2.5	Short Circuit Current (Isc)
2.6	Voltage at Maximum Power Point (Vmp)
2.7	Current at Maximum Power Point (Imp)
2.8	Battery durability test result
2.9	Module efficiency
2.10	Normal Operating Cell Temperature (NOCT)
	Module number
3	<b>Battery</b>
3.1	Nominal Capacity (Ah)
3.2	Nominal Voltage (V)
3.3	Float Voltage (V) specific to Lead Acid Batteries
3.4	Self-discharge rate per month
3.5	Charging Voltage (V)
3.6	Maximum Charge Current (A)
3.7	Depth of Discharge
4	<b>Charge Controller</b>
4.1	High Voltage Disconnect (V)
4.2	Low Voltage Reconnect (V)
4.3	Nominal Voltage (V)
4.4	Low Voltage disconnect (V)
4.5	Self-Consumption (A)

Note: Crystalline type solar PV panels are the only minimum quality recommended panels for importation.

## Article 5: Minimum service level requirements

The average household who has gained access to electricity in Rwanda has a system capable of supplying enough electricity to power at least:

- a) Three (3) lamps of at least 120 lumens each, operating at least four (4) hours per day;
- b) A mobile phone charge supply for at least two (2) hours per day,
- c) A radio charge supply for at least 5 hours per night, and
- d) Supply the above loads for least one day without input from the solar module/when there is no sunshine
- e) Product labelling for system parts is mandatory. The following information should be included on each of the following component types. The information should be included on the body of the product (or on an attached label or sticker).
  1. Lights: voltage, power, luminous flux
  2. Other appliances included with the system: voltage, power
  3. Solar modules: open circuit voltage, short circuit current, maximum power at standard test conditions of 1000 W/m<sup>2</sup> and 25°C
  4. Batteries: voltage, storage capacity (in mAh, Ah, or Wh), battery chemistry (e.g. lead-acid, lithium iron phosphate, lithium-ion, etc.)
- f) Dismountable system parts (e.g.; lamp and battery) and System compatibility is recommended to allow for spare parts replacement.

**NB:** To achieve this level of service, products should deliver enough electricity to meet the lighting service requirement while having sufficient remaining energy to meet the energy needs of the mobile phone charging and radio operation given a solar resource of 4.5 kWh/m<sup>2</sup>/day. If a radio is included with the system, the daily energy requirement for powering it is based on the consumption of the included radio (as reported in a test report from an appropriately accredited test laboratory). If a radio is not included, then the system should provide at least 5 Wh/day to operate the radio. The minimum energy allocated for mobile phone charging is 2 Wh/day.



## **Article 6: Warranty requirements**

This sets a minimum level of user protection from early failure. The mandatory after sales service to replace or repair a broken system for each component of the standalone solar home system, the warranty should cover both the system performance, availability of spare parts and system components.

A minimum of three (3) years warranty and an after sales contract that commits to the availability of spare parts and Technical service for a minimum 5 years after the installation of the system.

## **Article 7: Electrical installation**

Electrical installation shall follow the REGULATIONS 002/EL/ENERGY/RURA/2012 ON ELECTRICAL INSTALLATIONS.

## **Article 8: Battery**

No batteries should contain Cadmium or Mercury at levels greater than traceable amounts.

## **Article 9: Agreement**

The agreement between purchaser and supplier shall cover the following:

- Responsibilities of purchaser/user with timeline
- Responsibilities of the supplier
- Dispute resolutions/complaints handling
- Details of after sales services including timeline.

## **Article 10: Language**

To ensure proper use, basic operation and maintenance instructions should be provided to the end user in both Kinyarwanda and English.

**Article 11: Data records**

The Entrusted National Import Inspectors shall keep records of the imported Solar Home Systems indicating the quantities of the systems on the market, agreements on safe disposal and submit on request, copies of the records to the regulator in charge of e-waste management.

**Article 12: Non-compliant Solar Home Systems**

In case of Seized non-compliant Solar Home Systems without accreditation certificates compliant to the regulations and standards set forth, the importer shall be responsible for their safe disposal or re-exportation and at her/his own cost.

**Article 13: Disposal**

The regulator in charge of e-waste management and the importer shall work together to ensure adequate disposal of Solar Home System parts after they have served their purpose.


**Article 14: Repealing provision**

All prior provisions contrary to these guidelines are hereby repealed.

**Article 15: Commencement**

These guidelines come into force on the date of their publication. The guidelines shall be reviewed regularly when need arises.

Done at Kigali, on 21 JUN 2019 .....

  
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Minister of Infrastructure

