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Recommendations for small renewable energy and hybrid systems for rural electrification –

Part 6: Acceptance, operation, maintenance and replacement

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CONTENTS

INTERNATIONAL ELECTROTECHNICAL COMMISSION

RECOMMENDATIONS FOR SMALL RENEWABLE ENERGY AND HYBRID SYSTEMS FOR RURAL ELECTRIFICATION –

Part 6: Acceptance, operation, maintenance and replacement

FOREWORD

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The main task of IEC technical committees is to prepare International Standards. In exceptional circumstances, a technical committee may propose the publication of a technical specification when

- the required support cannot be obtained for the publication of an International Standard, despite repeated efforts, or
- the subject is still under technical development or where, for any other reason, there is the future but no immediate possibility of an agreement on an International Standard.

Technical specifications are subject to review within three years of publication to decide whether they can be transformed into International Standards.

IEC 62257-6, which is a technical specification, has been prepared by IEC technical committee 82: Solar photovoltaic energy systems.

This technical specification is based on IEC/PAS 62111(1999); it cancels and replaces the relevant parts of IEC/PAS 62111.

This technical specification is to be used in conjunction with

IEC 62257-1: *Recommendations for small renewable energy and hybrid systems for rural electrification – Part 1: General introduction to rural electrification*

IEC 62257-2: *Recommendations for small renewable energy and hybrid systems for rural electrification – Part 2: From requirements to a range of electrification systems*

IEC 62257-3: *Recommendations for small renewable energy and hybrid systems for rural electrification – Part 3: Project development and management*

IEC 62257-4: *Recommendations for small renewable energy and hybrid systems for rural electrification – Part 4: System selection and design* (to be published)

IEC 62257-5: *Recommendations for small renewable energy and hybrid systems for rural electrification – Part 5: Safety rules: Protection against electrical hazards* (to be published)

IEC 62257-6: *Recommendations for small renewable energy and hybrid systems for rural electrification – Part 6: Acceptance, operation, maintenance and replacement*

IEC 62257-7-1: *Recommendations for small renewable energy and hybrid systems for rural electrification – Part 7-1: Generators photovoltaic arrays* (under consideration)

IEC 62257-9-2: *Recommendations for small renewable energy and hybrid systems for rural electrification – Part 9-2: Microgrid (under consideration)*

IEC 62257-9-3: *Recommendations for small renewable energy and hybrid systems for rural electrification – Part 9-3: Integrated system – User's interface (under consideration)*

IEC 62257-9-4: *Recommendations for small renewable energy and hybrid systems for rural electrification – Part 9-4: Integrated system – User's installation (under consideration)*

The text of this technical specification is based on the following documents:

Enquiry draft	Report on voting
82/371/FDIS	82/384/RVC

Full information on the voting for the approval of this technical specification can be found in the report on voting indicated in the above table.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

The committee has decided that the contents of this publication will remain unchanged until the maintenance result date indicated on the IEC web site under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication will be

- transformed into an International Standard;
- reconfirmed;
- withdrawn;
- replaced by a revised edition, or
- amended.

A bilingual version of this publication may be issued at a later date.

INTRODUCTION

The IEC 62257 series intends to provide to the different players involved in rural electrification projects (such as project implementers, project contractors, project supervisors, installers, etc.) documents for the setting-up of renewable energy and hybrid systems with a.c. nominal voltage below 500 V, d.c. nominal voltage below 750 V and nominal power below 100 kVA.

These documents are recommendations:

- to choose the right system for the right place;
- to design the system;
- to operate and maintain the system.

These documents are focused only on rural electrification concentrating on but not specific to developing countries. They must not be considered as all inclusive to rural electrification. The documents try to promote the use of renewable energies in rural electrification; they do not deal with clean mechanisms developments at this time (CO_2 emission, carbon credit, etc.). Further developments in this field could be introduced in future steps.

This consistent set of documents is best considered as a whole with different parts corresponding to items for safety, sustainability of systems and at the lowest life cycle cost as possible. One of the main objectives is to provide the minimum sufficient requirements, relevant to the field of application that is: small renewable energy and hybrid off-grid systems.

The purpose of this technical specification is to propose a methodology to achieve the best technical and economic conditions for acceptance, operation, maintenance and replacement of equipment and complete system life cycle.

RECOMMENDATIONS FOR SMALL RENEWABLE ENERGY AND HYBRID SYSTEMS FOR RURAL ELECTRIFICATION –

Part 6: Acceptance, operation, maintenance and replacement

1 Scope

This technical specification is intended to describe the various rules to be applied for acceptance, operation, maintenance and replacement (AOMR) of decentralized rural electrification systems (DRES) which are designed to supply electric power for sites which are not connected to a large interconnected system, or a national grid, in order to meet basic needs.

The majority of these sites are:

- isolated dwellings;
- village houses;
- community services (public lighting, pumping, health centers, places of worship or cultural activities, administrative buildings, etc.);
- economic activities (workshops, micro-industry, etc.).

It proposes a methodology to achieve the best technical and economic conditions for acceptance, operation, maintenance and replacement of equipment and complete system life cycle.

It does not substitute for technical manuals provided by manufacturers for each equipment. The complexity of the system and application will dictate the level of required AOMR documentation.

2 Normative reference

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 62257 (all parts) *Recommendations for small renewable energy and hybrid systems for rural electrification*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1
AOMR actions
acceptance, operation , maintenance and replacement actions

3.2
implementation contract
contract between project developer and project implementer usually the result of a competitive sollicitation for proposals developed by the project developer on the basis of the general specification

3.3
electric equipment
item used for such puposes as generation, conversion, transmission, distribution or utilization of electric energy, such as electric machines, transformers, switchgear and controlgear, measuring instruments, protective devices, wiring systems, current-using equipment

[IEV 826-16-01].

3.4
REN
renewable energy

4 General aspects

4.1 Introduction to AOMR actions

Isolated electrification systems are designed to supply power to those individuals, communities or loads located in remote areas not connected to national grids.

These systems can be broken down into three categories:

- process electrification systems (for instance for pumping),
- individual electrification systems (IES) (single user, load or application),
- collective electrification systems (CES) (multiple user load or application).

In order to satisfy the various energy requirements both in terms of quality and quantity, six types of isolated micropower systems have been identified (see IEC 62257-2).

AOMR actions are introduced in Table 1.

A basic system acceptance process description is given in Table 2.

Table 1 – AOMR actions

Acceptance	• checking process to ensure that the system installation meets the requirement set forth in the implementation contract between the project developer and the project implementer • testing process to ensure that the micropower system operates according to the functional part of the implementation contract • once the parties have come to agreement, transfer the responsibility of the system
Operation	• managing business of system operation • monitoring «normal» system operation ("normal" operation = system supplies power complying with all the characteristics of the expected service, with the original designed configuration) • managing system electrical operation = executing actions on electrical circuits (configuration changes) • response to abnormal operating conditions = to provide service outside of the boundaries of the implementation contract (prolonged absence of REN sources) • response to abnormal system operation corrective actions (manual or automatic), troubleshooting and repair system or system components (diagnosing the cause(s) for failure, fault finding = to service the plant and restore its operating conditions further to an unpredictable failure • guaranteeing safety while performing (servicing) actions on the plant • performing analysis and retrofit of the system to account for new operating conditions
Maintenance	• preventive maintenance: keeping and maintaining the system to its «normal» operating state • corrective maintenance: adjusting, fixing or replacing components after fault recognition • conducting periodic tests and inspection
Replacement	• replacing the equipment on «normal» life cycle completion • replacing the equipment for upgrading purpose • dismantling and recycling at end of life cycle

Table 2 – System acceptance process description

Acceptance process		Objective	Responsible Party	Implementers	Content of a suggested data sheet
Phase 1	Preparation	To collect all information on the system	Project implementer	Project implementer/ subcontractor	List of contractual documents to be provided
Phase 2	Check of existing documentation, contract clauses	To check that all non operational contractual requirements are met: Documentation, manuals, spare parts, drawings, procedures, warranty contracts, etc.	Project developer	Consultant engineer	List of contractual documents to be provided
Phase 3	Commissioning step 1: Evaluation of the conformity of the installed system with the accepted design	To check that the equipment complies to the contractual accepted design and any differences are explained	Project developer	Consultant engineer	Equipment list: Initial design list/as built list/comments
	Commissioning step 2: Evaluation of qualification of the installation	To check that the system is ready to be operated	Project implementer	Project implementer/ subcontractor	Letter
	Commissioning step 3: Preliminary tests	To test that the system components operate correctly	Project developer	Consultant engineer	Component by component, verification: Proper type and reference according to the as built list Proper installation: check list of key points Proper operation: list of tests with targeted performances to be obtained
	Commissioning step 4: Performance testing	To check all the operating performances of the whole system	Project developer	Consultant engineer	List of system tests with targeted performances to be obtained
Phase 4	Agreement	Transfer of responsibility	Project implementer/ developer/ operator/ owner		Letter of acceptance