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Recommendations for renewable energy and hybrid systems for rural electrification –
Part 7-2: Generator set – Off-grid wind turbines

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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RECOMMENDATIONS FOR RENEWABLE ENERGY AND HYBRID SYSTEMS FOR RURAL ELECTRIFICATION –

Part 7-2: Generator set – Off-grid wind turbines

FOREWORD

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IEC TS 62257-7-2 has been prepared by IEC technical committee 82: Solar photovoltaic energy systems. It is a Technical Specification.

The text of this Technical Specification is based on the following documents:

Draft	Report on voting
82/1956/DTS	82/1995/RVDTS

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this Technical Specification is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/standardsdev/publications.

A list of all parts in the IEC 62257 series, published under the general title, *Recommendations for renewable energy and hybrid systems for rural electrification* can be found on the IEC website.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under webstore.iec.ch in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

INTRODUCTION

The IEC 62257 series of publications intends to provide to 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 AC voltage below 500 V, DC voltage below 750 V and power below 100 kW.

These publications provide recommendations for:

- choosing the right system for the right place;
- designing the system;
- operating and maintaining the system.

These publications are focused only on rural electrification concentrated in, but not specific to, developing countries. They are not considered as all-inclusive of rural electrification. The publications try to promote the use of renewable energies in rural electrification. They do not deal with clean mechanism developments at this time (CO2 emission, carbon credit, etc.). Further developments in this field could be introduced in future steps.

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

The purpose of this document is to provide guidance for the deployment of small wind turbines (a wind turbine with a rotor swept area smaller than or equal to 200 m^2, see IEC 61400-2: 2013) used in off-grid hybrid power system in rural electrification.

This document is a general introduction followed by more specific documents dedicated to the generation technologies which are the most currently used in rural electrification projects.

RECOMMENDATIONS FOR RENEWABLE ENERGY AND HYBRID SYSTEMS FOR RURAL ELECTRIFICATION –

Part 7-2: Generator set – Off-grid wind turbines

1 Scope

This document applies to all small wind turbines (SWTs) with a swept area smaller than or equal to 200 m^2, and designed for supplying electrical power to isolated sites used in systems as described in IEC TS 62257-2.

This document is not an exhaustive resource for the design, installation, operation or maintenance of small wind turbines and wind power systems, but is more focused on recommendations to provide strategies on selection and criteria which may affect the use of a small wind power system (SWPS) in a rural electrification project.

Only the hybrid collective electrification system (microgrid, isolated microgrid) including SWT(s) is considered in this document. SWT in an isolated microgrid can be a single wind turbine or multiple wind turbines. Isolated microgrid using only wind power generation is not discussed in this document. General functional configuration of SWT(s) in an off-grid hybrid power system is shown in Figure 1.

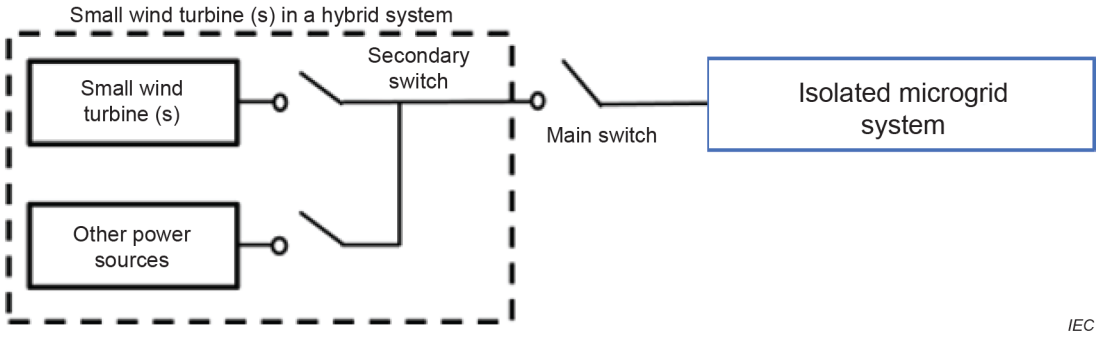


Figure 1 – General functional configuration of SWT(s) in an off-grid hybrid power system

The aim of this document is to provide users with the appropriate levels of reliability and safety of the equipment during its estimated service lifespan.

It describes the minimum safety requirements and does not claim to be an exhaustive instruction manual or design specification.

Compliance with this document does not exempt any person, organization, or corporation from the responsibility to comply with all other relevant regulations.

This document gives recommendations for the single SWT with a swept area smaller than or equal to 200 m^2, or multiple SWTs with other power sources of total capacity up to 100 kW in an off-grid hybrid power system.

The design life of a good quality modern wind turbine is 20 years. The real lifetime of a SWT is subjected to quite extreme loads throughout its life. This mostly depends on its designed

structure and reliability of moving parts, because the power in the wind increases with the cube of the speed.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 60038:2009, *IEC standard voltages*
IEC 60038:2009/AMD1:2021

IEC 60287 (all parts), *Electric cables – Calculation of the current rating*

IEC 60721-2-1:2013, *Classification of environmental conditions – Part 2-1: Environmental conditions appearing in nature – Temperature and humidity*

IEC 61140, *Protection against electric shock – Common aspects for installation and equipment*

IEC 61400-2:2013, *Wind turbines – Part 2: Small wind turbines*

IEC 61400-12-1, *Wind energy generation systems – Part 12-1: Power performance measurements of electricity producing wind turbines*

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

IEC TS 62257-4, *Recommendations for renewable energy and hybrid systems for rural electrification – Part 4: System selection and design*

IEC TS 62257-5, *Recommendations for renewable energy and hybrid systems for rural electrification – Part 5: Protection against electrical hazards*

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

IEC TS 62257-9-1, *Recommendations for renewable energy and hybrid systems for rural electrification – Part 9-1: Integrated systems – Micropower systems*

IEC TS 62257-9-2, *Recommendations for renewable energy and hybrid systems for rural electrification – Part 9-2: Integrated systems – Microgrids*

ISO 3864-1:2011, *Graphical symbols – Safety colours and safety signs – Part 1: Design principles for safety signs and safety markings*