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TECHNICAL SPECIFICATION

colour inside

Microgrids –
Part 1: Guidelines for microgrid projects planning and specification

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FOREWORD

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

IEC TS 62898, which is a Technical Specification, has been prepared by IEC technical committee 8: Systems aspects for electrical energy supply.

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

Enquiry draft	Report on voting
8/1445/DTS	8/1460/RVDTS

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

A list of all parts in the IEC 62898 series, published under the general title *Microgrids*, 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 "http://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- withdrawn,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.

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

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

Microgrids can serve different purposes depending on the primary objectives of their applications. They are usually seen as means to manage reliability of supply in a grid contingency and local optimization of energy supply by controlling distributed energy resources (DER). Microgrids also present a way to provide electricity supply in remote areas and to use clean and renewable energy as a systemic approach for rural electrification.

This part of IEC 62898 defines the guidelines for the general planning and design of microgrids, and IEC TS 62898-2 [1] defines the general technical requirements for operation and control of microgrids.

This document mainly covers the following issues:

- determination of microgrid purpose and application;
- preliminary study used for microgrid planning, including resource analysis, load forecast, DER planning and microgrid power system planning;
- principles of microgrid technical requirements that should be specified during planning stage;
- microgrid evaluation to select an optimal planning scheme for a microgrid project.

IEC TS 62898-2 mainly covers the following issues:

- operation requirements and control targets of microgrids under different operation modes;
- basic control strategies and methods under different operation modes;
- requirements of energy storage, monitoring and communication under different operation modes;
- power quality.

Microgrids can be stand-alone or be a sub-system of the smart grid. The technical requirements in this document and in IEC TS 62898-2 are intended to be consistent and in line with:

- system requirements from IEC System Committee Smart Energy,
- technical requirements from IEC 62786 for connection of generators intended to be operated in parallel with the microgrid,
- basic rules from IEC TC 64 and TC 99 for safety and quality of power distribution (essentially selectivity, through coordination of protective devices) in installations,
- basic rules from IEC TC 77/SC 77A for electromagnetic compatibility (EMC) issues,
- IEC TS 62257 (all parts) with respect to rural electrification,
- IEC TS 62749 with respect to power quality.

Local laws and regulations can overrule the requirements of this document.

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[1] Under preparation. Stage at the time of publication: IEC CD 62898-2:2017.

MICROGRIDS –

Part 1: Guidelines for microgrid projects planning and specification

1 Scope

The purpose of this part of IEC 62898, which is a Technical Specification, is to provide guidelines for microgrid projects planning and specification. Microgrids considered in this document are alternating current (AC) electrical systems with loads and distributed energy resources (DER) at low or medium voltage level. This document does not cover direct current (DC) microgrids.

Microgrids are classified into isolated microgrids and non-isolated microgrids. Isolated microgrids have no electrical connection to a wider electric power system. Non-isolated microgrids can act as controllable units to the electric power system and can operate in the following two modes:

- grid-connected mode;
- island mode.

This document will cover the following areas:

- microgrid application, resource analysis, generation forecast, and load forecast;
- DER planning and microgrid power system planning;
- high level technical requirements for DER in microgrids, for microgrid connection to the distribution system, and for control, protection and communication systems;
- evaluation of microgrid projects.

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, *IEC standard voltages*

IEC 60364 (all parts), *Low voltage electrical installations*

IEC 61936 (all parts), *Power installations exceeding 1 kV AC*

IEC TS 62749, *Assessment of power quality - Characteristics of electricity supplied by public networks*

3 Terms and definitions

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

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at http://www.electropedia.org/
- ISO Online browsing platform: available at http://www.iso.org/obp

3.1
black start
start-up of an electric power system from a blackout through internal energy resources

[SOURCE: IEC 60050-617:2009, 617-04-24]

3.2
busbar
low-impedance conductor to which several electric circuits can be connected at separate points

Note 1 to entry: In many cases, the busbar consists of a bar.

[SOURCE: IEC 60050-151:2001, 151-12-30]

3.3
converter
device for changing one or more characteristics associated with electric energy

Note 1 to entry: Characteristics associated with energy are for example voltage, number of phases and frequency including zero frequency.

[SOURCE: IEC 60050-151:2001, 151-13-36, modified – The words "electric energy" have been removed from the term]

3.4
combined heat and power
CHP
production of heat which is used for non-electrical purposes and also for the generation of electric energy

Note 1 to entry: Conventional power plants emit the heat produced as a useless byproduct of the generation of electric energy into the environment. With combined heat and power, the excess heat is captured for domestic or industrial heating purposes.

[SOURCE: IEC 60050-602:1983, 602-01-24, modified – The abbreviated term "CHP" has been added, as well as the note to entry. The definition has been rephrased]

3.5
earth
ground
part of the earth which is in electric contact with an earth electrode and whose electric potential is not necessarily equal to zero

[SOURCE: IEC 60050-195:1998, 195-01-03, modified – The adjective "local" has been removed from the term]

3.6
earthing arrangement
grounding arrangement
electric connections and devices involved in the earthing of a system, an installation and equipment

[SOURCE: IEC 60050-195:1998, 195-02-20, modified – The deprecated term has been removed]

3.7
earthing conductor
grounding conductor
conductor which provides a conductive path, or part of the conductive path, between a given point in a system or in an installation or in equipment and an earth electrode

[SOURCE: IEC 60050-195:1998, 195-02-03, modified – The deprecated term has been removed]

3.8
electromagnetic compatibility
EMC
ability of an equipment or system to function satisfactorily in its electromagnetic environment without introducing intolerable electromagnetic disturbances to anything in that environment

[SOURCE: IEC 60050-161:1990, 161-01-07]

3.9
distributed energy resources
DER
generators, including loads having a generating mode (such as electrical energy storage systems), connected to the low or medium voltage network, with their auxiliaries, protection and connection equipment, if any

3.10
distributed generation
generation of electric energy by multiple sources which are connected to the power distribution system

[SOURCE: IEC 60050-617:2009, 617-04-09, modified – The other preferred terms "embedded generation" and "dispersed generation" have been deleted]

3.11
distribution network
electrical facility and its components including poles, transformers, disconnects, relays, isolators, and wires that are owned or operated by an electrical utility for the purpose of distributing electrical energy from substations to customers

Note 1 to entry: Usually, the distribution network operates up to a nominal voltage of 35 kV.

3.12
in-plant point of coupling
IPC
point on a network inside a system or an installation, electrically nearest to a particular load, at which other loads are, or could be, connected

Note 1 to entry: The IPC is usually the point for which electromagnetic compatibility is to be considered.

[SOURCE: IEC 61000-2-4:2002, 3.1.7]

3.13
interface switch
switch (circuit breaker, switch or contactor) installed in the microgrid, for separating the part(s) of the microgrid containing at least one generation unit from the distribution network

3.14
interruptible load
load of particular consumers which, according to contract, can be disconnected by the supply undertaking for a limited period of time