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Microgrids

Part 3-3: Technical requirements — Self-regulation of dispatchable loads

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National foreword

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IEC TS 62898-3-3 has been prepared by subcommittee SC 8B: Decentralized electrical energy systems, of IEC technical committee TC 8: System aspects of electrical energy supply. It is a Technical Specification.

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

Draft	Report on voting
8B/155/DTS	8B/172/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 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 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- withdrawn,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.

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INTRODUCTION

Self-regulation of loads is a phenomenon known very well to transmission system operators, see Annex A. This effect historically emerged from the dynamic behaviour of electric motors that were used to directly power mechanical drivetrains, for example for pumps or air blowers. The higher the rotational speed of the drive, the more active power is used and vice versa. This effect automatically contributes to frequency stabilization without a supervisory control.

There is also a self-regulation effect on the voltage due to resistive loads. At higher voltages, the current through a resistive load increases and therefore the active power consumption increases as well. This increased current also flows through the impedance of the upstream supply network, resulting in a voltage reduction at the load's point of connection and vice versa. This effect helps to stabilise the voltage and is also used indirectly with power system stabilisers (PSS). Modulated system voltage at transmission level is translated to corresponding changes of active power consumption of loads at distribution level which dampen low frequency power oscillations.

This document intends to emulate the above explained beneficial behaviours with dispatchable loads, which do not affect the functionality with regard to the end user, and to make this effect available for frequency and voltage stabilization in microgrids. Dispatchable loads can modify the active power consumption while maintaining their functionality by keeping system parameters within acceptable ranges. This is usually achieved by the use of an internal energy storage, for example thermal energy storage in refrigerators, freezers, air conditioners, water heaters, or electrical energy storage units such as batteries. As the loads respond to the frequency and voltage they experience, no communication channels or complex control systems are necessary to include small loads in the common task of keeping the electric system stable.

MICROGRIDS –

Part 3-3: Technical requirements – Self-regulation of dispatchable loads

1 Scope

This part of IEC 62898 deals with frequency and voltage stabilization of AC microgrids by dispatchable loads, which react autonomously on variations of frequency and voltage with a change in active power consumption. Both 50 Hz and 60 Hz electric power systems are covered. This document gives requirements to emulate the self-regulation effect of loads including synthetic inertia.

The loads recommended for this approach are noncritical loads, this means their power modulation will not significantly affect the user as some kind of energy storage is involved which effectively decouples end energy use from the electricity supply by the electric network. The self-regulation of loads is beneficial both in island mode and grid-connected mode. This document gives the details of the self-regulation behaviour but does not stipulate which loads shall participate in this approach as an optional function.

This document covers both continuously controllable loads with droop control and ON/OFF-switchable loads with staged settings. The scope of this document is limited to loads connected to the voltage level up to 35 kV. Reactive power for voltage stabilization and DC microgrids are excluded in this document.

NOTE 1 If agreed between system operator and grid user, the self-regulating principles outlined in this document can also be applied to loads in other electricity networks, see IEC/ISO Directives, Part 1:2023, C.4.3.2, Example 1.

NOTE 2 According to 3.1.7, critical loads with an electrical energy storage system such as an uninterruptable power supply are considered as noncritical and therefore dispatchable.

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.

ISO/IEC 17025, *General requirements for the competence of testing and calibration laboratories*

3 Terms, definitions, abbreviated terms and symbols

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

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

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