

TECHNICAL SPECIFICATION



Microgrids –
Part 3-2: Technical requirements – Energy management systems

iTeh Standards
(<https://standards.iteh.ai>)
Document Preview

[IEC TS 62898-3-2:2024](https://standards.iteh.ai/catalog/standards/iec/db6bc457-8466-4334-ad46-92c061d875be/iec-ts-62898-3-2-2024)

<https://standards.iteh.ai/catalog/standards/iec/db6bc457-8466-4334-ad46-92c061d875be/iec-ts-62898-3-2-2024>



THIS PUBLICATION IS COPYRIGHT PROTECTED
Copyright © 2024 IEC, Geneva, Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either IEC or IEC's member National Committee in the country of the requester. If you have any questions about IEC copyright or have an enquiry about obtaining additional rights to this publication, please contact the address below or your local IEC member National Committee for further information.

IEC Secretariat
3, rue de Varembe
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
info@iec.ch
www.iec.ch

About the IEC

The International Electrotechnical Commission (IEC) is the leading global organization that prepares and publishes International Standards for all electrical, electronic and related technologies.

About IEC publications

The technical content of IEC publications is kept under constant review by the IEC. Please make sure that you have the latest edition, a corrigendum or an amendment might have been published.

IEC publications search - webstore.iec.ch/advsearchform

The advanced search enables to find IEC publications by a variety of criteria (reference number, text, technical committee, ...). It also gives information on projects, replaced and withdrawn publications.

IEC Just Published - webstore.iec.ch/justpublished

Stay up to date on all new IEC publications. Just Published details all new publications released. Available online and once a month by email.

IEC Customer Service Centre - webstore.iec.ch/csc

If you wish to give us your feedback on this publication or need further assistance, please contact the Customer Service Centre: sales@iec.ch.

IEC Products & Services Portal - products.iec.ch

Discover our powerful search engine and read freely all the publications previews, graphical symbols and the glossary. With a subscription you will always have access to up to date content tailored to your needs.

Electropedia - www.electropedia.org

The world's leading online dictionary on electrotechnology, containing more than 22 500 terminological entries in English and French, with equivalent terms in 25 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

International Standards.
Document Preview

[IEC TS 62898-3-2:2024](https://standards.iteh.ai/catalog/standards/iec/db6bc457-8466-4334-ad46-92c061d875be/iec-ts-62898-3-2-2024)

<https://standards.iteh.ai/catalog/standards/iec/db6bc457-8466-4334-ad46-92c061d875be/iec-ts-62898-3-2-2024>



TECHNICAL SPECIFICATION



**Microgrids –
Part 3-2: Technical requirements – Energy management systems**

iTeh Standards
(<https://standards.itih.ai>)
Document Preview

[IEC TS 62898-3-2:2024](https://standards.itih.ai/catalog/standards/iec/db6bc457-8466-4334-ad46-92c061d875be/iec-ts-62898-3-2-2024)

<https://standards.itih.ai/catalog/standards/iec/db6bc457-8466-4334-ad46-92c061d875be/iec-ts-62898-3-2-2024>

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

ICS 29.240.01

ISBN 978-2-8322-8075-1

Warning! Make sure that you obtained this publication from an authorized distributor.

CONTENTS

| | |
|--|----|
| FOREWORD..... | 6 |
| INTRODUCTION..... | 8 |
| 1 Scope..... | 9 |
| 2 Normative references | 10 |
| 3 Terms, definitions and abbreviated terms | 11 |
| 3.1 Terms and definitions..... | 11 |
| 3.2 Abbreviated terms..... | 12 |
| 4 General | 12 |
| 4.1 System architecture and functional mapping | 12 |
| 4.2 Stand-alone MEMS | 14 |
| 4.3 Integrated MEMS | 14 |
| 4.4 Communication protocols and cyber security | 14 |
| 4.4.1 Basic principle | 14 |
| 4.4.2 Recommended methods | 14 |
| 4.4.3 Cyber security | 16 |
| 4.5 Overview of MEMS function requirement..... | 16 |
| 5 Functional requirements | 18 |
| 5.1 Dispatch optimization..... | 18 |
| 5.1.1 Dispatch and scheduling models..... | 18 |
| 5.1.2 Dispatch optimization modes and objective functions..... | 19 |
| 5.1.3 Management of technical constraint conditions..... | 20 |
| 5.1.4 Optimization types and approaches | 21 |
| 5.2 Forecast function | 22 |
| 5.2.1 General | 22 |
| 5.2.2 Forecasting requirements and time dimension | 22 |
| 5.2.3 Renewable power generation forecast | 23 |
| 5.2.4 Load forecast..... | 23 |
| 5.2.5 Electricity price forecast | 23 |
| 5.2.6 Input values of forecast | 23 |
| 5.3 Demand side integration | 24 |
| 5.3.1 General | 24 |
| 5.3.2 Demand side management | 24 |
| 5.3.3 Demand side response | 24 |
| 5.3.4 Energy optimisation | 25 |
| 5.3.5 Power and energy exchange with upstream grid | 25 |
| 5.4 Flexible resource management | 25 |
| 5.4.1 General | 25 |
| 5.4.2 Controllable load management | 26 |
| 5.4.3 Energy management..... | 26 |
| 5.5 Data archiving, trending and reporting | 26 |
| 5.6 Market trading module (ancillary services) and market data | 26 |
| Annex A (informative) Examples of actual microgrid application cases integrated with associated functions of MEMS | 27 |
| A.1 General..... | 27 |
| A.2 Application CN1: Obtaining lower energy cost, lower pollution emission, and higher penetration level of renewable energy | 27 |
| A.2.1 Overview | 27 |

| | | |
|-------|---|----|
| A.2.2 | System structure..... | 27 |
| A.2.3 | Energy management system..... | 28 |
| A.2.4 | Energy management system operation | 28 |
| A.3 | Application CN2: Enhancing local power supply reliability for critical loads with AC/DC hybrid microgrid | 29 |
| A.3.1 | Overview | 29 |
| A.3.2 | System structure..... | 30 |
| A.3.3 | Energy management strategy | 30 |
| A.3.4 | Operation modes | 31 |
| A.3.5 | Black start | 31 |
| A.3.6 | Energy management strategy | 32 |
| A.3.7 | Operation modes | 32 |
| A.3.8 | Black start | 33 |
| A.4 | Application DE1: Intelligent, data-driven, and grid stabilizing energy management platform – Developing a pilot for industrial diesel application | 33 |
| A.4.1 | Overview | 33 |
| A.4.2 | System structure – IDGE Platform | 34 |
| A.4.3 | Energy management strategy | 36 |
| A.4.4 | Demonstrator and evaluation | 39 |
| A.5 | Application CN4: Electrifying islands with wind-PV-diesel-energy storage and hybrid microgrids..... | 41 |
| A.5.1 | Overview | 41 |
| A.5.2 | Purpose | 42 |
| A.5.3 | Main functions of MEMS | 42 |
| A.5.4 | Applications | 42 |
| A.6 | Application CN5: Optimizing local energy resources with demand side integrated microgrid including PV and energy storage..... | 43 |
| A.6.1 | Overview | 43 |
| A.6.2 | Purpose | 43 |
| A.6.3 | Main functions of MEMS | 43 |
| A.6.4 | Applications..... | 44 |
| A.7 | Application JP1: Local independent grid supplied by an energy production system of combining biomass, biogas, wood chip co-firing, photovoltaic and small wind power: the Hachinohe demonstration project from Japan | 45 |
| A.7.1 | Overview | 45 |
| A.7.2 | Purpose..... | 46 |
| A.7.3 | Main functions of the control system | 46 |
| A.7.4 | Applications..... | 47 |
| A.8 | Application JP2: Islanding operation of microgrid with only converter connected resources and no-rotating machine: the 2005 World Exposition, Aichi, from Japan | 49 |
| A.8.1 | Overview | 49 |
| A.8.2 | Purpose..... | 50 |
| A.8.3 | Main functions of the control system | 51 |
| A.8.4 | Applications..... | 52 |
| A.9 | Application JP3: Grasping the impact of mass solar power generation on the actual power system and empirical research on system stabilization measures using storage batteries: Miyakojima Mega Solar Demonstration Research | 53 |
| A.9.1 | Overview | 53 |
| A.9.2 | Purpose..... | 56 |

| | | |
|-----------------------|--|----|
| A.9.3 | Main functions of the control system | 56 |
| A.9.4 | Applications | 56 |
| A.10 | Application IN1: Microgrid dedicated for energy communities on a public distribution grid: Shakti demonstration in H2020 IElectrix project | 59 |
| A.10.1 | Overview | 59 |
| A.10.2 | Purpose | 60 |
| A.10.3 | Main functions of the MEMS | 60 |
| A.10.4 | Cybersecurity | 62 |
| A.10.5 | Additional applications | 62 |
| A.11 | Application QAT1: Desert microgrid, research microgrid in desert environment, education city Doha, Qatar | 63 |
| A.11.1 | Overview | 63 |
| A.11.2 | System description | 63 |
| A.11.3 | Energy management system (EMS) | 64 |
| A.11.4 | Operational modes | 64 |
| Annex B (informative) | Communication and data exchange | 66 |
| B.1 | Information exchange and MEMS | 66 |
| B.2 | EMS-API reference model (IEC 61970-1) | 66 |
| B.3 | Architecture of the communication system | 67 |
| Bibliography | | 69 |
| Figure 1 | – Conceptual map of a power system consisting of a microgrid | 13 |
| Figure 2 | – Functional mapping for operation and control of microgrids | 13 |
| Figure 3 | – Typical three-layer communication for structure 1 | 15 |
| Figure 4 | – Typical two-layer communication for structure 2 | 16 |
| Figure 5 | – Microgrid energy management system functional architecture | 17 |
| Figure A.1 | – The main single diagram of Goldwind microgrid | 28 |
| Figure A.2 | – Application of EES for wind generation and load matching | 29 |
| Figure A.3 | – Electric network topology of Shangyu AC/DC microgrid | 30 |
| Figure A.4 | – Basic structure of the IDGE Platform | 34 |
| Figure A.5 | – Functional requirements | 35 |
| Figure A.6 | – Interplay of Layer 1 and Layer 2 | 36 |
| Figure A.7 | – Model reaction | 37 |
| Figure A.8 | – Technical platform layout | 39 |
| Figure A.9 | – Dong’ao Island microgrid network topology | 41 |
| Figure A.10 | – Guishan Island Microgrid network topology | 42 |
| Figure A.11 | – Snapshot of active power and reactive power sharing among diesel generator | 43 |
| Figure A.12 | – Solar power and load forecasting in Foshan industrial microgrid | 44 |
| Figure A.13 | – Example of power generation and consumption detailed on a particular day in Foshan industrial microgrid | 44 |
| Figure A.14 | – Air conditioner power consumption and space temperature for a particular user in Guangzhou residential microgrid | 45 |
| Figure A.15 | – Overview of Hachinohe demonstration project | 46 |
| Figure A.16 | – Hierarchical structure of the energy management system | 47 |
| Figure A.17 | – Performances for grid connected operation: deviation from planned flow | 47 |
| Figure A.18 | – Obtained success rate of maintaining frequency and voltage | 48 |

| | |
|--|----|
| Figure A.19 – Overall performance under different battery operation modes | 49 |
| Figure A.20 – Overview of equipment configuration | 50 |
| Figure A.21 – Appearance of equipment | 50 |
| Figure A.22 – PAFC system configuration | 51 |
| Figure A.23 – Block diagram for isolated operation | 52 |
| Figure A.24 – Power quality (voltage and frequency on Oct. 11 th) | 53 |
| Figure A.25 – Overview of the Miyakojima island power system | 54 |
| Figure A.26 – Overview of the demonstration research facility | 55 |
| Figure A.27 – Picture of the demonstration research facility | 56 |
| Figure A.28 – Result of the PV + NaS storage long term operation | 57 |
| Figure A.29 – NaS storage operation for short term power fluctuation levelling | 57 |
| Figure A.30 – Example of output fluctuation suppression effect | 58 |
| Figure A.31 – Image of frequency fluctuation suppression effect | 59 |
| Figure A.32 – SHAKTI pilot architecture | 60 |
| Figure A.33 – Microgrid SCADA example | 61 |
| Figure A.34 – Example of PV monitoring in the EMS | 61 |
| Figure A.35 – Example of off-grid mode preparation | 62 |
| Figure A.36 – Electric network topology of the Desert- μ Grid | 63 |
| Figure A.37 – Energy management system of the Desert- μ Grid | 64 |
| Figure B.1 – EMS-API reference model | 67 |
| Figure B.2 – Reference architecture based on IEC TR 62357-1 | 68 |
| Table A.1 – Operation modes | 32 |
| Table A.2 – Description of the microgrids | 43 |
| Table A.3 – Description of the microgrids | 48 |
| Table A.4 – Outline of the facility | 54 |
| Table B.1 – Examples of information exchange | 66 |

INTERNATIONAL ELECTROTECHNICAL COMMISSION

MICROGRIDS –

Part 3-2: Technical requirements –
Energy management systems

FOREWORD

- 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as “IEC Publication(s)”). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
- 2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
- 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
- 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 9) IEC draws attention to the possibility that the implementation of this document may involve the use of (a) patent(s). IEC takes no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, IEC had not received notice of (a) patent(s), which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at <https://patents.iec.ch>. IEC shall not be held responsible for identifying any or all such patent rights.

IEC TS 62898-3-2 has been prepared by subcommittee 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/153/DTS | 8B/177/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/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, or
- revised.

IMPORTANT – The "colour inside" logo on the cover page of this document 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.

iTeh Standards
(<https://standards.iteh.ai>)
Document Preview

[IEC TS 62898-3-2:2024](#)

<https://standards.iteh.ai/catalog/standards/iec/db6bc457-8466-4334-ad46-92c061d875be/iec-ts-62898-3-2-2024>

INTRODUCTION

Microgrids can serve various purposes depending on the primary objectives of their applications. They are usually seen as a technical means to manage reliability of supply and to facilitate local optimization of energy supply by controlling distributed energy resources (DER). Microgrids also present a way to provide electricity supply in remote areas, to use renewable energy as a systematic approach for rural electrification and to increase resiliency and security of supply to end users.

IEC TS 62898 series is intended to provide general guidelines and technical requirements for microgrid projects.

IEC TS 62898-1 mainly covers the following issues:

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

IEC TS 62898-2 mainly covers the following issues:

- operation requirements and control targets of microgrids under various operation modes,
- the basic control strategies and methods under various operation modes,
- the requirements of electrical energy storage (EES), relay protection, monitoring and communication under various operation modes,
- power quality.

IEC TS 62898-3-XX subseries technical specifications deal with the technical requirements of microgrids.

IEC TS 62898-3-1 covers the protection and dynamic control of microgrids.

The present document covers microgrid energy management systems (MEMS).

MICROGRIDS –

Part 3-2: Technical requirements – Energy management systems

1 Scope

The purpose of this part of IEC 62898 is to provide technical requirements for the operation of energy management systems of microgrids. This document applies to utility-interconnected or islanded microgrids. This document describes specific recommendations for low-voltage (LV) and medium-voltage (MV) systems.

This document focuses on developing standards of energy management systems aimed for microgrids integrated in decentralized energy systems or public distribution grids. It concerns some particularities that are not totally covered by the existing conventional energy system. The microgrid energy management systems are being studied by various actors (utilities, manufacturers, and energy providers) on actual demonstration projects and application use case. The aims of this document are to make the state of the art of existing energy management systems used in actual microgrids projects, to classify the relevant functions which can be accomplished by microgrid energy management systems, and to recommend necessary technical requirements for energy management systems of future microgrids.

This document includes the following items:

- main performances of key components of microgrid: decentralized energy resources, energy storages and controllable loads),
- description of main functions and topological blocks of microgrid energy management systems (MEMS),
- specification of information exchange protocol between main function blocks, linked to microgrid monitoring and control systems (MMCS).

Main functions of MEMS:

- power and energy management among different resources within microgrid including active and reactive power flows with different time scales,
- power and energy forecasts of microgrid,
- energy balancing between upstream grid and microgrid energy resources according to power and energy forecast and upstream and local constraints,
- economic and environmental optimization,
- possible service capacities such as capacity market auctions and resiliency anticipation: new business models,
- data archiving, trending, reporting and evaluation of operation capacities in various operation modes.

MEMS can have some other additional functions according to microgrid size and actual application cases:

- tariff and market trading management,
- utility ancillary services such as frequency regulation, voltage regulation, power quality and reliability improvement, demand response possibilities, change of operation modes linked to MMCS.

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 60364-8-82, *Low-voltage electrical installations – Part 8-82: Functional aspects – Prosumer's low-voltage electrical installations*

IEC TS 60364-8-3, *Low-voltage electrical installations – Part 8-3: Functional aspects – Operation of prosumer's electrical installations*

IEC 60870 (all parts), *Telecontrol equipment and systems*

IEC 60870-5-101, *Telecontrol equipment and systems – Part 5-101: Transmission protocols – Companion standard for basic telecontrol tasks*

IEC 60870-5-104, *Telecontrol equipment and systems – Part 5-104: Transmission protocols – Network access for IEC 60870-5-101 using standard transport profiles*

IEC 61850 (all parts), *Communication networks and systems in substations*

IEC 61850-8-1, *Communication networks and systems for power utility automation – Part 8-1: Specific communication service mapping (SCSM) – Mappings to MMS (ISO 9506-1 and ISO 9506-2) and to ISO/IEC 8802-3*

IEC 61850-8-2, *Communication networks and systems for power utility automation – Part 8-2: Specific communication service mapping (SCSM) – Mapping to Extensible Messaging Presence Protocol (XMPP)*

IEC TR 61850-90-1, *Communication networks and systems for power utility automation – Part 90-1: Use of IEC 61850 for the communication between substations*

IEC TR 61850-90-2, *Communication networks and systems for power utility automation – Part 90-2: Using IEC 61850 for communication between substations and control centres*

IEC 61970-1:2005, *Energy management system application program interface (EMS-API) – Part 1: Guidelines and general requirements*

IEC 62351, *Power systems management and associated information exchange – Data and communications security*

IEC 62443 (all parts), *Security for industrial automation and control systems*

IEC 62443-3-3, *Industrial communication networks – Network and system security – Part 3-3: System security requirements and security levels*

IEC 62443-4-2, *Security for industrial automation and control systems – Part 4-2: Technical security requirements for IACS components*

IEC TS 62898-1, *Microgrids – Part 1: Guidelines for microgrid projects planning and specification*

IEC TS 62898-2, *Microgrids – Part 2: Guidelines for operation*

IEC TS 62898-3-1, *Microgrids – Technical requirements – Part 3-1: Protection and dynamic control*

IEC TS 62898-3-4:2023, *Microgrids – Technical requirements – Part 3-4: Microgrid monitoring and control systems*

IEEE Std 1815-2012, *IEEE Standard for Electric Power Systems Communications-Distributed Network Protocol (DNP3)*

MODBUS Application Protocol Specification:

https://www.modbus.org/docs/Modbus_Application_Protocol_V1_1b.pdf [viewed 2023-12-12]

3 Terms, definitions and abbreviated terms

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 Terms and definitions

3.1.1

energy management system

EMS

system monitoring, operating, controlling, and managing DER and loads

[SOURCE: IEC 60364-8-1:2019, 3.2.1 – modified: "Electrical" has been deleted from the term, "energy resources and loads of the installations" has been replaced by "DER and loads".]

3.1.2

distributed energy resources

DER

generators (with their auxiliaries, protection and connection equipment), including loads having a generating mode (such as electrical energy storage systems), connected to a low-voltage or a medium-voltage network

[SOURCE: IEC 60050-617:2017, 617-04-20]

3.1.3

microgrid energy management system

MEMS

system operating and controlling energy resources and loads of the microgrid

[SOURCE: IEC 60050-617:2018, 617-04-25]

3.1.4

microgrid controller

physical device/system which includes MMCS functions and can include MEMS as well, for example, in small size microgrid

3.1.5

microgrid monitoring and control systems

MMCS

computer or PLC based system performing real time monitoring and control of microgrid

3.1.6**point of common coupling****PCC**

point in an electric power system, electrically nearest to a particular load, at which other loads are, or could be, connected

[SOURCE: IEC 60050-614:2016, 614-01-12]

3.1.7**point of connection****POC**

reference point on the electric power system where the user's electrical facility is connected

[SOURCE: IEC 60050-617:2009, 617-04-01]

3.1.8**state of charge****SOC**

available capacity in a battery pack or system expressed as a percentage of rated capacity

[SOURCE: ISO 12405-4:2018, 3.20]

3.1.9**state of health****SOH**

general condition of a battery and its ability to deliver the specified performance compared with a new battery (0 % to 100 %)

3.2 Abbreviated terms

EES electric energy storage

ESS energy storage system [IEC TS 62898-3-2:2024](https://standards.iteh.ai/standards/iec/db6bc457-8466-4334-ad46-92c061d875be/iec-ts-62898-3-2-2024)

<https://standards.iteh.ai/catalog/standards/iec/db6bc457-8466-4334-ad46-92c061d875be/iec-ts-62898-3-2-2024>

4 General**4.1 System architecture and functional mapping**

Generally, microgrids can be integrated into the electric power system (see Figure 1), and MEMS is one of the key components or functions of microgrid. Figure 1 is based on a general view and the displayed blocks have other possibilities depending on the size of the microgrids and the type of applications.