

# SYSTEMS REFERENCE DELIVERABLE



**Generic smart grid requirements –  
Part 2-1: Grid related domains**



## THIS PUBLICATION IS COPYRIGHT PROTECTED

Copyright © 2019 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 Central Office  
3, rue de Varembe  
CH-1211 Geneva 20  
Switzerland

Tel.: +41 22 919 02 11  
[info@iec.ch](mailto:info@iec.ch)  
[www.iec.ch](http://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](http://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 It also gives information on projects, replaced and withdrawn publications.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](http://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](http://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](mailto:sales@iec.ch).

#### Electropedia - [www.electropedia.org](http://www.electropedia.org)

The world's leading online dictionary on electrotechnology, containing more than 22 000 terminological entries in English and French, with equivalent terms in 16 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

#### IEC Glossary - [std.iec.ch/glossary](http://std.iec.ch/glossary)

67 000 electrotechnical terminology entries in English and French extracted from the Terms and Definitions clause of IEC publications issued since 2002. Some entries have been collected from earlier publications of IEC TC 37, 77, 86 and CISPR.

Preview generated by EVS

# SYSTEMS REFERENCE DELIVERABLE



---

**Generic smart grid requirements –  
Part 2-1: Grid related domains**

INTERNATIONAL  
ELECTROTECHNICAL  
COMMISSION

---

ICS 29.020; 29.240; 33.200

ISBN 978-2-8322-6880-3

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

## CONTENTS

FOREWORD.....	5
INTRODUCTION.....	7
1 Scope.....	8
2 Normative references .....	8
3 Terms, definitions and abbreviated terms .....	9
3.1 Terms and definitions.....	9
3.2 Abbreviated terms.....	10
4 Grid management.....	11
4.1 Purpose and scope .....	11
4.1.1 Objective .....	11
4.1.2 Informative general context of grid management.....	11
4.2 Business analysis .....	14
4.2.1 General overview.....	14
4.2.2 List of Business Use Cases and Business Roles of the domains.....	18
4.2.3 List of System Use Cases and System Roles.....	23
4.3 Generic smart grid requirements .....	24
4.3.1 Requirements extracted from Use Cases .....	24
5 Transmission grid management.....	25
5.1 Purpose and scope .....	25
5.2 Business analysis .....	26
5.2.1 General .....	26
5.2.2 List of Business Use Cases and Business Roles of the domains.....	26
6 Distribution grid management.....	26
6.1 Purpose and scope .....	26
6.2 Business analysis .....	26
6.2.1 General .....	26
6.2.2 Regional options.....	26
6.2.3 List of Business Use Cases and Business Roles of the domains.....	26
6.2.4 List of System Use Cases and System Roles.....	26
6.3 Generic smart grid requirements .....	28
7 Microgrids .....	29
7.1 Purpose and scope .....	29
7.1.1 Objective .....	29
7.1.2 General context .....	30
7.2 Business analysis .....	31
7.2.1 General overview.....	31
7.2.2 Isolated microgrids .....	32
7.2.3 Facility microgrids.....	32
7.2.4 Distribution microgrids .....	33
7.2.5 Relation with other domains.....	34
7.2.6 List of Business Use Cases and Business Roles of the domain.....	34
7.2.7 List of System Use Cases and System Roles.....	35
7.3 Generic smart grid requirements .....	36
8 Smart substation automation .....	38
8.1 Purpose and scope .....	38
8.1.1 Objective .....	38

8.1.2	General context .....	38
8.2	Business analysis .....	38
8.2.1	General overview .....	38
8.2.2	List of Business Use Cases and Business Roles of the domains .....	38
8.2.3	List of System Use Cases and System Roles .....	39
8.3	Generic smart grid requirements .....	40
Annex A (informative)	Links with other TCs and gathered materials .....	41
A.1	General .....	41
A.2	Distribution grid management .....	41
A.2.1	Identified TCs .....	41
A.2.2	Liaisons from other TCs contributing to the smart grid requirements of the domain .....	41
Annex B (informative)	Use Cases .....	42
B.1	Grid management .....	42
B.1.1	Business Use Cases .....	42
B.2	Distribution grid management .....	54
B.2.1	Business Use Cases .....	54
B.2.2	System Use Cases .....	68
B.3	Microgrids .....	101
B.3.1	Business Use Cases .....	101
B.4	Smart substation automation .....	125
B.4.1	Business Use Cases .....	125
Bibliography	.....	130
Figure 1	– New smart business processes enhanced by smart grid functions .....	14
Figure 2	– Non-exhaustive description of the microgrid domain in the SGAM architecture .....	31
Figure B.1	– Theoretical example of the failure probability of equipment .....	44
Figure B.2	– Theoretical example of yield curve probability of failure of equipment taking into account a poor AHI .....	45
Figure B.3	– Utility stakes definition process .....	46
Table 1	– Content of IEC SRD 62913-2-1:2019 .....	8
Table 2	– Business Roles of the electrical grid-related domains .....	18
Table 3	– Identified Business Use Cases of the domain .....	20
Table 4	– Identified System Use Cases of the domain .....	24
Table 5	– Requirements extracted from grid management Use Cases .....	25
Table 6	– System Roles of the domain .....	27
Table 7	– Requirements extracted from distribution grid management Use Cases .....	28
Table 8	– Business Roles of the domain .....	35
Table 9	– Identified Business Use Cases of the domain .....	35
Table 10	– Identified System Use Cases of the domain .....	36
Table 11	– Requirements extracted from microgrids Use Cases .....	36
Table 12	– Business Roles of the domain .....	39
Table 13	– Identified Business Use Cases of the domain .....	39
Table 14	– Identified System Use Cases of the domain .....	40

Table 15 – Requirements extracted from smart substation automation Use Cases .....	40
Table B.1 – UC62913-2-1-B001: Carry out definition and optimization of maintenance and asset renewal priorities programmes .....	42
Table B.2 – UC62913-2-1-B007: Operate the MV network in real-time .....	55
Table B.3 – UC62913-2-1-B012: Manage faults on the MV network .....	64
Table B.4 – UC62913-2-1-S001: Perform centralized voltage control based on state estimation .....	68
Table B.5 – UC62913-2-1-S002: Manage faults on the distribution network using advanced FLISR system .....	82
Table B.6 – UC62913-2-1-B013: Guarantee a continuity in load service by islanding the microgrid.....	101
Table B.7 – UC62913-2-1-B014: Enable automation systems to perform operational functions in best conditions .....	125

This document is a preview generated by EVS

## INTERNATIONAL ELECTROTECHNICAL COMMISSION

**GENERIC SMART GRID REQUIREMENTS –****Part 2-1: Grid related domains****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) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

IEC SRD 62913-2-1, which is a Systems Reference Deliverable, has been prepared by IEC systems committee Smart Energy.

The text of this Systems Reference Deliverable is based on the following documents:

Draft SRD	Report on voting
SyCSmartEnergy/78/DTS	SyCSmartEnergy/96/RVDTS

Full information on the voting for the approval of this Systems Reference Deliverable 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 SRD 62913 series, published under the general title *Generic smart grid requirements*, can be found on the IEC website.

The committee has decided that the contents of this publication will remain unchanged until the stability date indicated on the IEC website under "<http://webstore.iec.ch>" in the data related to the specific publication. At this date, the publication 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

Under the general title *Generic smart grid requirements*, the IEC SRD 62913 series consists of the following parts:

- *Part 1: Specific application of the Use Case methodology for defining generic smart grid requirements according to the IEC systems approach;*
- Part 2 is composed of 5 subparts which refer to the clusters that group several domains:
  - *Part 2-1: Grid related domains* – these include transmission grid management, distribution grid management, microgrids and smart substation automation;
  - *Part 2-2: Market related domain;*
  - *Part 2-3: Resources connected to the grid domains* – these include bulk generation, distributed energy resources, smart home / commercial / industrial / DR-customer energy management, and energy storage;
  - *Part 2-4: Electric transportation related domain;*

The IEC SRD 62913 series refers to 'clusters' of domains for its different parts so as to provide a neutral term for document management purposes simply because it is necessary to split in several documents the broad scope of smart energy.

The purpose of the IEC SRD 62913-2 series is to initiate the process of listing, organizing, making available the Use Cases which carry the smart energy requirements that should be addressed by the IEC core technical standards. The IEC's systems approach will require adapted tools and processes to facilitate its implementation, and until they are available to IEC technical committees, National Committees and experts, the IEC SRD 62913-2 series should be seen as an illustration and the first stepping stone towards this systems approach implementation. Referencing, naming and grouping Use Cases or requirements will be further developed when tools such as IEC Use Case repository are available (using SGAM and other classification methods). The current content of the IEC SRD 62913-2 series is not exhaustive, but the current content illustrates the priorities for the smart energy domain at the time of publication. It is important that the content in terms of Use Cases, roles and requirements continues to grow to encompass the requirements of the broad smart energy stakeholders (both within the IEC community and more generally the other market stakeholders).

Use Cases are, for now, classified as follows.

- For business Use Cases: SGAM Domain {G|T|D|DER|CP} (multiple domains possible) / B\_{Business Use case number}/SB\_{ sub BUC Use case number/...}
- For system Use Cases: SGAM Domain {G|T|D|DER|CP} (multiple domains possible) / (sub) Business use Case Ref /S\_{ System Use cases number}/SS\_{ Sub System Use cases number/...}

The document for each domain is composed as follows.

- Purpose and scope.
- Business analysis: to address the domain's strategic goals and principles regarding its smart grid environment. It also lists business Use Cases and system Use Cases identified, their associated business roles and system roles (actors) and the simplified role model highlighting main interactions between actors.
- Generic smart grid requirements: extracted from Use Cases described in Annex B.
- Annex A lists links between domains and technical committees.
- Annex B includes a complete description of Use Cases per domain based on IEC 62559-2.
- Bibliography.

This document is based on the inputs from domain experts as well as existing materials in a smart grid environment.

## GENERIC SMART GRID REQUIREMENTS –

### Part 2-1: Grid related domains

#### 1 Scope

This part of IEC SRD 62913 initiates and illustrates the IEC's systems approach based on Use Cases and involving the identification of generic smart grid requirements for further standardization work for grid related domains – i.e. grid management regrouping: transmission grid management, distribution grid management, microgrids and smart substation automation domains – based on the methods and tools developed in IEC SRD 62913-1.

The Grid management domain groups Use Cases and associated requirements common to the EHV, HV and MV/LV networks operations and the business analysis of the general electric network life cycle. Use Cases specific to parts of the general electric network are described in transmission grid management, distribution grid management, microgrids and smart substation automation clauses.

This document captures possible “common and repeated usage” of a smart grid system, under the format of “Use Cases” with a view to feeding further standardization activities. Use Cases can be described in different ways and can represent competing alternatives. From there, this document derives the common requirements to be considered by these further standardization activities in term of interfaces between actors interacting with the given system.

To this end, Use Case implementations are given for information purposes only. The interface requirements to be considered for later standardization activities are summarized (typically information pieces, communication services and specific non-functional requirements: performance level, security specification, etc.).

This analysis is based on the business input from domain experts as well as existing material on grid management in a smart grid environment when relevant. Table 1 highlights the domains and business Use Cases described in this document.

**Table 1 – Content of IEC SRD 62913-2-1:2019**

Domain	Content	Scope
Grid management	Described with 1 business Use Case	Asset management
Transmission grid management	n/a	
Distribution grid management	Described with 1 business Use Case and 2 system Use Cases	Network operations in real time using new automations / centralized voltage control
Microgrids	Described with 1 business Use Case	
Smart substation automation	Described with 1 business Use Case	

#### 2 Normative references

There are no normative references in this document.