

SYSTEMS REFERENCE DELIVERABLE



**Generic smart grid requirements –
Part 1: Specific application of the use case methodology for defining generic
smart grid requirements according to the IEC systems approach**



THIS PUBLICATION IS COPYRIGHT PROTECTED
Copyright © 2022 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 It also gives information on projects, replaced and withdrawn publications.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. 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 22 300 terminological entries in English and French, with equivalent terms in 19 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

SYSTEMS REFERENCE DELIVERABLE



**Generic smart grid requirements –
Part 1: Specific application of the use case methodology for defining generic
smart grid requirements according to the IEC systems approach**

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

ICS 29.020; 29.240

ISBN 978-2-8322-4434-0

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	8
3.1 Terms and definitions.....	8
3.2 Abbreviated terms.....	12
4 Systems approach.....	13
4.1 A systems perspective	13
4.2 Applying the IEC systems approach to smart energy.....	13
4.3 Main areas of work.....	15
4.4 Breaking down the scope	16
4.5 Link with some existing conceptual models	16
5 Specific application of use case methodology for defining generic smart grid requirements	17
5.1 General.....	17
5.2 Why the use case methodology is particularly adapted to smart grid	17
5.2.1 General	17
5.2.2 Linking the use case methodology with existing frameworks	18
5.2.3 Notion of role.....	21
5.3 Applying the use case methodology to define generic smart grid requirements.....	22
5.3.1 A customer-centric and business-processes-driven approach	22
5.3.2 Generic smart grid requirements.....	26
5.4 Approach used to elaborate a consolidated smart grid role model.....	30
6 UML profile for modelling smart grid use cases.....	31
6.1 A formal approach of use cases modelling	31
6.1.1 General	31
6.1.2 Key principles	31
6.2 UML-driven top-down approach methodology.....	32
6.2.1 Formalism and objectives	32
6.2.2 Modelling language.....	32
6.2.3 Scope and information type classification: diagrams and main elements.....	33
6.2.4 Key benefits	34
6.2.5 Types of diagrams and views.....	36
6.3 IEC use cases UML profile concepts	38
7 UML modelling diagrams	40
Annex A (informative) Existing Actors Lists.....	44
Annex B (informative) Content of the use case mapped on IEC 62559-2 template	45
B.1 Description of the use case.....	45
B.1.1 Name of use case.....	45
B.1.2 Version management.....	45
B.1.3 Scope and objectives of use case.....	45
B.1.4 Narrative of use case.....	45
B.1.5 Key performance indicators (KPI)	46
B.1.6 Use case conditions.....	46

B.1.7	Further information to the use case for classification / mapping	46
B.1.8	General remarks	46
B.2	Diagrams of use case	46
B.3	Technical details	47
B.3.1	Actors	47
B.3.2	References	47
B.4	Step by step analysis of use case	47
B.4.1	Overview of scenarios	47
B.4.2	Steps of scenarios	48
B.5	Information exchanged	48
B.6	Requirements (optional)	48
B.7	Common terms and definitions	48
B.8	Custom information (optional)	49
B.9	IEC 62559-2 UML Modelling	49
Annex C (informative)	Example of telecommunications related non-functional requirements	51
Annex D (informative)	Existing Smart Grid Conceptual Models	52
Bibliography	54
Figure 1	– The GridWise Architecture Council's model (NIST, 2009)	18
Figure 2	– Simplification of the GWAC model (CEN-CENELEC-ETSI, 2014)	19
Figure 3	– Smart grid plane domains and hierarchical zones	19
Figure 4	– The Smart Grid Architecture Model (CEN-CENELEC-ETSI, 2014)	20
Figure 5	– Interactions between the use case methodology and the Smart Grid Architecture Model (based on CEN-CENELEC-ETSI, 2014)	21
Figure 6	– Defining smart grid requirements methodology	23
Figure 7	– Point of view of a domain role	24
Figure 8	– The first two levels of detail used to capture generic smart grid requirements	25
Figure 9	– The three levels of detail used to capture generic smart grid requirements	26
Figure 10	– Generic smart grid functional requirements and non-functional requirements captured in use cases	28
Figure 11	– Example of representation of a domain's role model	30
Figure 12	– Example of representation of relations between roles	31
Figure 13	– Four-layer model architecture	33
Figure 14	– UML use case profile for the IEC SRD 62913 series aligned with the IEC 62559 series	36
Figure 15	– Use case overview diagram	37
Figure 16	– Domain overview diagram	37
Figure 17	– BUC-SUC relations diagram	38
Figure 18	– Mapping between use case concepts and architecture concepts	40
Figure 19	– Domain overview concepts UML model	41
Figure 20	– Use case overview concepts UML model	41
Figure 21	– Scenario overview concepts UML model	42
Figure 22	– Activity overview concepts UML model	43
Figure 23	– Requirement overview concepts UML model	43

Figure C.1 – Use case mapping to IEC 62559-2.....49

Figure C.2 – Use case mapping to IEC 62559-2 – Scenario and activities.....50

Figure D.1 – NIST/SGIP Smart Grid Conceptual Model.....52

Figure D.2 – M490 domains53

Table 1 – Differences between business use cases and system use cases 12

Table 2 – Links between SGAM and IEC SRD 62913 series domains..... 17

Table 3 – Use cases concepts 39

Table C.1 – Example of telecommunications related non-functional requirements51

Table D.1 – NIST/SGIP domains..... 52

Table D.2 – SGAM domains53

Currently in preview, click buy full version

INTERNATIONAL ELECTROTECHNICAL COMMISSION

GENERIC SMART GRID REQUIREMENTS –

Part 1: Specific application of the use case methodology for defining generic smart grid requirements according to the IEC systems approach

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

This second edition cancels and replaces the first edition published in 2019. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

- it consolidates requirements identification and management and their associated naming rules;
- it leverages IEC SRD 63200:2021, *Definition of extended SGAM Smart Energy Grid Reference Architecture Model*;
- it highlights links between use case methodology and other tools and methodologies (i.e. TOGAF/ArchiMate as used in IEC 61968-1:2020).

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

Draft	Report on voting
SyCSmartEnergy /169/DTS	SyCSmartEnergy /204/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 Systems Reference Deliverable 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 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 document will remain unchanged until the stability date indicated on the IEC website under webstore.iec.ch on 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

IEC SRD 62913 generic smart grid requirements are needed to fulfil the SG3 decision 2 made by the SMB at its February 2010 meeting (SMB/4204/DL, Decision 137/10) requesting the need to describe all the functional and system requirements for all smart grid applications.

The IEC Smart Grid Standardization Roadmap states that "the standardization process should offer a formal path between the application as 'requested' by smart grid (stakeholders) and the standards themselves, i.e. a 'top-down' process", whilst at the same time recognizing that for various reasons in many cases this path has not been the one implemented. This has in turn led to inconsistencies in standards.

The purpose of the IEC systems approach is to ensure and improve the interoperability between smart energy systems and components. This approach is based on the business needs expressed by the market. The main purpose of capturing and sharing generic smart grid requirements is the constitution of a basis for coming standardization work, with standards ensuring and facilitating the deployment of smart grid applications.

A working group has been set up within IEC SyC Smart Energy in order to capture the smart grid requirements derived from the market needs, using a standardized approach based on use cases as described in the IEC 62559 series. This work is building on existing use cases, namely within the IEC when they exist, and is carried out collaboratively with the experts of the relevant technical committees.

The IEC SRD 62913 series will deliver an applicable methodology to draft use cases (IEC SRD 62913-1), clarifying 'who does what' with regard to smart energy use cases, and it will also initiate the process of listing, organizing and making available the use cases which carry the smart energy requirements which should be addressed by the IEC core technical standards (IEC SRD 62913-2 series). The IEC systems approach will require adapted tools and processes to facilitate its implementation, and until they are available to the IEC National Committees and experts, the IEC SRD 62913-2 series should be understood as the first stepping stone towards this systems approach implementation. IEC SRD 62913-3 will be a roles database, based on a harmonized naming methodology, to ensure consistency when drafting smart energy use cases. This will provide a consistent and ready-to-use framework for all standardization stakeholders.

Use cases in the top-down approach of IEC SyC Smart Energy (C/1845/RV) are tools to identify smart grid requirements used to assess situations in standards (gaps or overlaps) and in that way contribute to interoperability. These requirements can also be used further as input for interoperability profiles for the testing phase.

These requirements should then feed into the work carried out by IEC SyC Smart Energy with other technical committees in order to ensure the technical standards are developed taking into account the needs and priorities of the smart grid market.

This document corresponds to the specific application of the use case methodology for defining generic smart grid requirements according to the IEC systems approach.

GENERIC SMART GRID REQUIREMENTS –

Part 1: Specific application of the use case methodology for defining generic smart grid requirements according to the IEC systems approach

1 Scope

This part of IEC SRD 62913 describes a common approach for IEC technical committees to define generic smart grid requirements for further standardization work. It uses as input the use case methodology defined as part of the IEC 62559 series, and provides a more detailed methodology for describing use cases and extracting requirements from these use cases. This will achieve a consistent and homogeneous description of generic requirements for the different areas which make up the smart grid environment.

2 Normative references

There are no normative references in this document.

3 Terms, definitions and abbreviated terms

3.1 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>

3.1.1 activity

part of a scenario that can be executed by one or more roles

Note 1 to entry: The details of an activity are described through actions. However, if it is necessary, intermediate levels can be created when activities describe an activity.

3.1.2 actor

entity that communicates and interacts

Note 1 to entry: These actors can include people, software applications, systems, databases, and even the power system itself.

Note 2 to entry: In IEC SRD 62913 this term includes the concepts of business role and system role involved in use cases.

[SOURCE: IEC 62559-2:2015, 3.2]

3.1.3 business case

explanation or set of reasons describing how a business decision will improve a business, product, etc. and how it will affect costs and profits and attract investments

Note 1 to entry: Equivalent to strategic goals and principles which drive business processes.