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Edition 1.0 2019-05

SYSTEMS REFERENCE DELIVERABLE

colour inside

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

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

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ELECTROTECHNICAL
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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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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

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IEC SRD 62913-1, 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/80/DTS	SyCSmartEnergy/100/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 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- withdrawn,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

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’s 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.

IEC SRD 62913 will deliver an applicable methodology to draft Use Cases (IEC SRD 62913-1), clarifying ‘who does what’ with regards 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). The IEC's systems approach will require adapted tools and processes to facilitate its implementation, and until they are available to the IEC National Committees and experts, IEC SRD 62913-2 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 may 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 is necessary to 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 where 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.

3.1.4
business process
chain of logical connected, repetitive activities that utilizes the enterprise's resources to refine an object (physical or mental) for the purpose of achieving specified and measurable results/products for internal or external customers

Note 1 to entry: In the context of IEC SRD 62913, the business processes describe the sequenced interactions between several roles of a system.

Note 2 to entry: Business processes can be described or modelled as business Use Cases.

[SOURCE: Ericsson Quality Institute (1993): Business Process Management, Gothenburg, Sweden]

3.1.5
business role
role describing a finite set of responsibilities that is assumed by a party

Note 1 to entry: Organizations, organizational entities and physical persons are examples of business roles.

3.1.6
cluster
group of items organized by criteria

3.1.7
consumer
end user of electricity

Note 1 to entry: Consumers never generate or store the use of electricity.

Note 2 to entry: Traditionally, three consumer types are discussed: residential, industrial and commercial.

3.1.8
demand response
DR
action resulting from management of the electricity demand in response to supply conditions

[SOURCE: IEC 60050-617:2011, 617-04-16]

3.1.9
domain
group of related subjects of standardization

[SOURCE: IEC 60050-901:2013, 901-01-03, modified – The term "field of standardization" has been replaced by "domain".]

3.1.10
functional requirement
requirement that describes what the system must do

Note 1 to entry: They are actions in response to events, or actions performed autonomously. They represent operations and features provided.

[SOURCE: IEC PAS 62559:2008, 7.2.6.2]

3.1.11
level of maturity
one of a set of structured levels that describe how well a process, or Use Case, is implemented through an organization and relates to its degree of formality, optimization and reliability

Note 1 to entry: Proposed levels of maturity:

– Level "Already implemented": the process is implemented in and between several organizations, it is well defined, reliable, sustainable and few uncertainties remain in its framework (regulatory, business or technological).

– Level "Adjustments in progress": the process is implemented in a few organizations, it is well defined but subject to remaining major uncertainties in its framework (regulatory, business or technological).

– Level "Explorative": the process is tested in very few organizations, it is not completely defined and subject to numerous major uncertainties in its framework (regulatory, business or technological).

3.1.12
non-functional requirement
NFR
requirement that describes what qualities the system must contain from an execution and performance perspective

Note 1 to entry: These are also known as “constraints”, “behaviour”, “criteria”, “performance targets”, etc. They set limits or controls on how well the system performs the functional requirements.

Note 2 to entry: Non-functional requirements include: reliability, security, usability, upgradeability, expandability, scalability, compatibility, safety, performance, and conformance.

[SOURCE: IEC PAS 62559:2008, 7.2.6.2]

3.1.13
prosumer
end user of electricity who may also generate, store and manage the use of electricity

3.1.14
requirement
provision that conveys criteria to be fulfilled

[SOURCE: IEC 60050-901:2013, 901-05-05]

3.1.15
role
type of actor which has responsibilities and represents the external intended behaviour of a party

EXAMPLE A legally defined market participant (e.g. grid operator, customer), a generic role which represents a bundle of possible roles (e.g. flexibility operator) or an artificially defined body needed for generic process and Use Case descriptions.

Note 1 to entry: IEC SRD 62913 series uses two kinds of role: business roles and system roles.

Note 2 to entry: Legally or generically defined external actors can be named and identified by their roles.

[SOURCE: SG-CG/M490/C:2012-12]

3.1.16
scenario
possible sequence of interactions

[SOURCE: SG-CG/M490/E:2012-12; definition 3.10]

3.1.17
service
specific transaction satisfied by a business process involving two or more roles

3.1.18
smart grid
electric power system that utilizes information exchange and control technologies, distributed computing and associated sensors and actuators

Note 1 to entry: Purposes of smart grids are, for example,

– to integrate the behaviour and actions of the network users and other stakeholders,

– to efficiently deliver sustainable, economic and secure electricity supplies.

[SOURCE: IEC 60050-617:2011, 617-04-13, modified – The second part of the definition has been moved to a Note to entry.]

3.1.19
smart grid function
transformation of a number of input data, collected with the use of information and communication technologies, into a number of technical results to enable one or several business processes of the electric power system

Note 1 to entry: The implementation of smart grid functions requires the coordinated use of a series of equipment and software (generally called smart grid systems, such as AMI or DER management system).

Note 2 to entry: Smart grid functions and the associated interactions between systems, devices and operators can be described or modelled as system Use Cases.

3.1.20
system
set of interrelated elements considered in a defined context as a whole and separated from their environment

Note 1 to entry: System is defined in the systems activities Administrative Circular AC/33/2013 as: “a group of interacting, interrelated, or independent elements forming a purposeful whole of a complexity that requires specific structures and work methods in order to support applications and services relevant to IEC stakeholders”.

[SOURCE: IEC 62559-2:2015, 3.7]

3.1.21
system role
role describing a finite set of functionalities that is assumed by an entity

Note 1 to entry: Device, information system and equipment are examples of system roles.

3.1.22
transmission of electricity
transfer in bulk of electricity, from generating stations to areas of consumption

[SOURCE: IEC 60050-601:1985, 601-01-09]

3.1.23
use case

specification of a set of actions performed by a system, which yields an observable result that is, typically, of value for one or more actors or other stakeholders of the system

[SOURCE: SG-CG/M490/E:2012-12]

Note 1 to entry: There are two types of Use Case:

– Business Use Cases describe how business roles interact to execute a business process. These processes are derived from services, i.e. business transactions, which have previously been identified.

– System Use Cases describe how system and/or business roles of a given system interact to perform a smart grid function required to enable or facilitate the business processes described in business Use Cases. Their purpose is to detail the execution of those processes from an information system perspective.

Note 2 to entry: Since a smart grid function can be used to enable or facilitate more than one business process, a system Use Case can be linked to more than one business Use Case.

Table 2 highlights the differences between these two types of Use Case.

Table 1 – Differences between business and system Use Cases

Type of Use Case	Description	Roles involved
Business Use Cases (BUC)	Depicts a business process – Expected to be system agnostic	Business roles (organizations, organizational entities or physical persons)
System Use Cases (SUC)	Depicts a function or sub-function supporting one or several business processes	Business roles and system roles (devices, information system)

3.2 Abbreviated terms

AMI advanced metering infrastructures
BPMN business process model and notation
BUC-SUC business use case-system use case
CCTS core component technical specification
CEN European Committee for Standardization
CENELEC European Committee for Electrotechnical Standardization
CIM common information model
DER distributed energy resources
DSO distribution system operator
ebIX European forum for energy business information exchange
EES electrical energy storage
EFET European federation of energy traders
ENTSO-E European network of transmission system operators for electricity
ETSI European Telecommunications Standards Institute
EURELECTRIC Union of the Electricity Industry
EV electric vehicle
EVSE electric vehicle supply equipment
GWAC GridWise®[1] Architecture Council
HV high voltage
LV-MV low voltage-medium voltage
MDA model driven architecture
NFR non-functional requirement
NIST US National Institute of Standards and Technology
SDO standards development organization

[1] This information is given for the convenience of users of this document and does not constitute an endorsement by IEC.

SGAM	smart grid architecture model
SMB	IEC Standardization Management Board
TSO	transmission system operator
UML	unified modelling language
UN/Cefact	United Nations/centre for trade facilitation and electronic business
WAN-IAN	wide area network – internet area network
XML	extensible markup language

4 Systems approach

4.1 A systems perspective

As stated in the Administrative Circular AC/33/2013: As part of the system approach implemented by the IEC, systems committees have been defined to work "at the systems instead of the product level to define reference architectures, Use Cases and appropriate standards and guidance on the interfaces, functionality and interaction of a system …".

The multiplicity of technologies and their convergence in many new and emerging markets, however – particularly those involving large-scale infrastructure – now demand a top-down approach to standardization, starting at the system or system-architecture rather than at the product level. System standards are also increasingly required in sectors such as environment, safety and health.

Although the introduction of such processes in the IEC began some years ago, a major effort is now required to improve understanding of them and to widen their application. It will be necessary to take account of the implied need for increased co-operation with many other standards-developing organizations, as well as with relevant non-standards bodies in the international arena. There will also be implications for the IEC's conformity assessment systems and processes.

Use Cases are used to facilitate co-operation at a system level with other standards development organizations (SDOs), non-traditional players of electrotechnology, regional organizations and users of smart energy systems closing the many open loops. Inside IEC they provide a convergence platform with overall system level value for support and guidance of the technical committees and other standards development groups, both inside and outside the IEC.

In order to achieve interoperability, Use Cases are used, in a top-down approach of IEC SyC Smart Energy, to derive generic smart grid requirements further used to assess situations in standards (gaps and overlaps) and so contribute to interoperability through better standardization. Note that Use Cases also provide a solid platform to define the testing cases to specify interfaces.

As defined in IEC 60050-617:2011, 617-04-13, a smart grid is an "electric power system that utilizes information exchange and control technologies, distributed computing and associated sensors and actuators, for purposes such as:

- to integrate the behaviour and actions of the network users and other stakeholders,
- to efficiently deliver sustainable, economic and secure electricity supplies."

Smart energy in addition to smart grid includes heat and gas in its scope as interactions. IEC SyC Smart Energy explores needs to optimize the energy use between electricity, heat and gas and seek value through a larger range of flexibility possibilities (technologies, cost).

The use of the term 'generic' in this document needs to be clarified. IEC standards need to address the maximum number of requirements needed by its stakeholders, namely those that