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SYSTEMS REFERENCE DELIVERABLE

colour inside

Generic smart grid requirements – Part 2-3: Resources connected to the grid domains

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GENERIC SMART GRID REQUIREMENTS –

Part 2-3: Resources connected to the grid domains

FOREWORD

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IEC SRD 62913-2-3, 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/89/DTS	SyCSmartEnergy/98/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- withdrawn,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

The IEC SRD 62913 series has been broken down into domains so as to provide a neutral term for document management purposes. 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*;

IEC SRD 62913 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 this document is to define the generic smart grid requirements of resources connected to the grid domains, i.e. distributed energy resources, smart home/commercial/industrial/DR-customer energy management, energy storage, and bulk generation domains, based on the methods and tools developed in IEC SRD 62913-1.

The document for each domain is composed as follows.

- Purpose and scope.
- The business analysis: to address 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, technical committees and gathered materials (existing standardization documents, user stories, Use Cases and functional architectures).
- 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 2-3: Resources connected to the grid 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 resources connected to the electric power systems – i.e. distributed energy resources, smart home/commercial/industrial/DR-customer energy management, energy storage, and bulk generation domains – based on the methods and tools developed in IEC SRD 62913-1.

This document captures possible "common and repeated usage" of a smart grid system, under the format of "Uses 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.

Electric vehicles are on one hand considered as a DER and normally should fit in IEC SRD 62913-2-3; but on the other hand, and for historical reasons, they are separated into two documents and covered in the IEC SRD 62913-2-4 electric transportation domain.

The document will be updated as new editions are published. Table 1 highlights the business areas covered in this document.

Table 1 – Content of IEC SRD 62913-2-3:2019

Domain	Content	Scope described
Distributed energy resources	Identified with 41 business Use Cases and 36 system Use Cases	Operation and monitoring of a DER
Smart home/commercial/industrial/ DR-customer energy management	Described with 8 business Use Cases and 14 system Use Cases	Smart home, smart building, multi-building complexes
Energy storage	Described with 2 business Use Cases	EES services for grid users and system operators
Bulk generation	n/a	n/a

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
ancillary services
services necessary for the operation of an electric power system provided by the system operator and/or by power system users

Note 1 to entry: System ancillary services may include the participation in frequency regulation, reactive power regulation, active power reservation, etc.

[SOURCE: IEC 60050-617:2009, 617-03-09]

3.1.2
automated control
aggregate of operations aimed at sustaining or/and improving the functioning of a controlled object without direct human participation and in accordance with a prescribed control objective

EXAMPLE Automatic response to signals such as dynamic peak period notifications, price period changes or flexibility requests.

Note 1 to entry: The automated control is configured and tuned by the client/resident and the client/resident can override it if needed.

3.1.3
capacity firming
method that uses storage to control the ramp rate (MW/min), smooth and mitigate rapid output changes from renewable generation due to different natural parameters such as wind speed variability affecting wind generation or shading of solar generation due to clouds

Note 1 to entry: It is important because these rapid output changes must be offset by other "dispatchable" generation.

[SOURCE: DOE Global energy storage database, Glossary]

3.1.4
congestion
<electric power system> situation in a transmission or distribution network requiring, in parts of an electric power system, a limitation of load flow

[SOURCE: IEC 60050-617:2009, 617-03-04]

3.1.5
congestion mitigation
set of one or more actions set up to avoid grid congestions by means such as by increasing the transfer capacity of the grid, by curtailing demand connected to the grid or by curtailing generation units

Note 1 to entry: Congestion in transmission and distribution grids refers to a situation in which the demand for power transfer exceeds the transfer capability of a grid.

3.1.6
dispatchable generation source
source of electricity that can be dispatched at the request of power grid operators or of the plant owner

Note 1 to entry: That is, generating plants that can be turned on or off, or can adjust their power output according to an order.

3.1.7
flexible load
load of consumers (in kW) which can be reduced or increased for a limited period of time at the request of an external actor according to contractual arrangements

Note 1 to entry: The control is automatic and based on technology or devices operated remotely due to the volume of consumers participating – such as residential consumers.

Note 2 to entry: The control may target specific appliances, such as space-heaters for instance.

3.1.8
distributed energy resource
DER
distributed set of one or more energy service resources, including generators, energy storage, controllable load and ancillary services

3.1.9
dynamic peak period
DPP
superseding calendar which replaces the initial price schedule during a short period of time when facing a peak demand

3.1.10
electric power system
EPS
network of electrical components deployed to supply and transfer electric power to a load

Note 1 to entry: The EPS may include generation units.

3.1.11
electrical energy storage
EES
process which consists in using various forms of energy such as mechanical, chemical, electrochemical, electrical, or thermal energy to store energy that will later be converted to electricity

Note 1 to entry: This domain report covers any type of EES which can charge electricity to and discharge electricity from any source.

3.1.12
electrical energy storage management
collection of methods used to manage EES with software, hardware, and services associated with the intelligent monitoring, management, and control of EES, for the specific purposes such as the enhancement of a system's efficiency, cost reduction or optimization of energy utilization to meet EES users' needs

3.1.13
electrical connection point
ECP
point of electrical connection between the DER source or sink of energy and any EPS

Note 1 to entry: Each DER unit has an ECP connecting it to its local power system; groups of DER units have an ECP where they interconnect to the power system at a specific site or plant; a group of DER units plus local loads have an ECP where they are interconnected to the utility power system.

Note 2 to entry: For those ECPs between a utility EPS and a plant or site EPS, this point is identical to the point of common coupling (PCC) in IEEE Std 1547, *Standard for Interconnection and Interoperability of Distributed Energy Resources with Associated Electric Power Systems Interfaces*.

3.1.14
electricity data
electricity-related data, either generation or consumption, coming from the electricity meter or from electrical devices

3.1.15
energy meter
instrument intended to measure electrical energy by integrating power with respect to time

[SOURCE: IEC 60050-313:2001, 313-01-35]

3.1.16
energy shifting
principle of shifting the timing of energy use by, for example, charging electricity during off-peak time and by discharging it during peak hours to reduce the cost to purchase electricity

3.1.17
flexibility
modification of electricity injection and/or extraction, on an individual or aggregated level, in reaction to an external signal in order to provide a service within the energy system

Note 1 to entry: Definition based on EURELECTRIC, Active Distribution System Management. A key tool for the smooth integration of Distributed Generation, 2013]

3.1.18
frequency regulation
ability of a balancing authority to help the interconnection maintain scheduled frequency

Note 1 to entry: This assistance can include both turbine governor response and automatic generation control.

3.1.19
grid stabilization
process requisite to stabilize power transmission and distribution networks with the operation of power plants

Note 1 to entry: Grid stabilization can be achieved, for example, by stabilizing the frequency of electric power produced on an island and by stabilizing voltage at the end of a long transmission line.

3.1.20
historian
software service which accumulates time-stamped data, events and alarms in a database which can be queried or used for further actions

3.1.21
home area network
HAN
in-house local area network which interconnects domestic equipment and can be used for energy management purposes

[SOURCE: CEN/CLC/ETSI TR 50572:2011]

Note 1 to entry: There can be multiple HANs inside a customer's premises.

3.1.22
islanding
process whereby a power system is split into two or more islands

[SOURCE: IEC 60050-603:1986, 603-04-31]

Note 1 to entry: Islanding is either a deliberate emergency measure, or the result of automatic protection or control action, or the result of human error.

Note 2 to entry: In this document, islanding refers to a measure to avoid load shedding in an area by immediately supplying power to the area from EES, and temporarily form an islanding status after the power supply from grids fails due to, for instance, a contingency.

3.1.23
load following
adjusting the output of power generation plants to meet the electricity demands which vary in a particular period

3.1.24
manual control
mode that allows clients or residents to directly control their consumptions depending on information provided by the energy market player(s) they have contracted with

Note 1 to entry: Sometimes this manual control mode is the only one available when technology or the electrical devices are not able to respond automatically to dynamic peak period notifications, price period changes or flexible requests.

3.1.25
operating reserves
all resources, generation or consumption, available to the system operator within a short interval of time to provide for frequency regulation or balancing purposes

Note 1 to entry: Operating reserves consist of spinning reserve, the increasing power output of generators that are already connected to the power grids, and non-spinning reserve, the extra generating capacity that is not currently connected to the system but can be brought online after a short delay.

[SOURCE: ENTSO-E: System operation guideline]

3.1.26
peak shaving
process needed to reduce peak demand by storing energy when demand is low and releasing energy when demand is high to level out electricity load throughout the day

3.1.27
price-based management
management method based on the fact that in order to modulate clients' consumptions during a day, a week or a peak period, the electricity supplier can offer temporarily higher electricity prices in order to tempt clients to erase or postpone the use of some of their electric devices

Note 1 to entry: Price-based control therefore combines variable electricity prices and the sending of price incentives to clients for them to be able to control manually or automatically the use of their electric devices.

3.1.28
quality of service
collective effect of service performance which determines the degree of satisfaction of a user of the service

Note 1 to entry: The quality of service is characterized by the combined aspects of service support performance, service operability performance, severability performance, service integrity and other factors specific to each service.

[SOURCE: IEC 60050-191:1990/AMD1:1999, 191-19-01]