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

FOREWORD.....	6
INTRODUCTION.....	8
1 Scope.....	9
2 Normative references	9
3 Terms, definitions and abbreviated terms	10
3.1 Terms and definitions.....	10
3.2 Abbreviated terms.....	15
4 Distributed energy resources	16
4.1 Purpose and scope.....	16
4.1.1 Purpose: business analysis of DERs.....	16
4.1.2 Scope: DERs as sources of generation.....	16
4.2 Business analysis of DER systems	17
4.2.1 Benefits and challenges of grid-connected DER systems.....	17
4.2.2 Stakeholders involved in the DER domain	20
4.2.3 Traffic light concept for DERs	20
4.2.4 Business drivers and objectives of DER stakeholders.....	21
4.2.5 DER grid services.....	23
4.2.6 Regional differences.....	29
4.2.7 List of business roles and business Use Cases of the domain	29
4.2.8 List of system Use Cases and system roles.....	33
5 Smart home/commercial/industrial/DR-customer energy management	41
5.1 Purpose and scope.....	41
5.1.1 Clause objective.....	41
5.1.2 General context.....	41
5.2 Business analysis	42
5.2.1 General overview.....	42
5.2.2 List of business roles and business Use Cases of the domain	43
5.2.3 List of system Use Cases and system roles	48
5.3 Smart home requirements for the smart grid	55
5.3.1 Smart grid requirements extracted from smart home Use Cases	55
5.3.2 Other requirements.....	72
6 Energy storage	72
6.1 Purpose and scope	72
6.1.1 Clause objective	72
6.1.2 General context	72
6.2 Business analysis	74
6.2.1 General overview.....	74
6.2.2 EES grid services	74
6.2.3 List of business Use Cases and business roles of the domain	78
6.2.4 List of system Use Cases and system roles	80
6.3 EES smart grid requirements	82
6.3.1 Smart grid requirements extracted from EES Use Cases	82
6.3.2 Other requirements.....	82
Annex A (informative) Links with other TCs and gathered materials	84
A.1 Distributed energy resources	84
A.1.1 Identified TCs	84

A.1.2	Gathered materials	84
A.1.3	Description of the five-level hierarchical diagram	85
A.2	Smart home/commercial/industrial/DR-customer energy management	87
A.2.1	Identified TCs	87
A.2.2	Gathered materials	87
A.2.3	Liaisons from other TCs contributing to the smart grid requirements of the domain	96
A.3	Energy storage	97
A.3.1	Identified TCs	97
A.3.2	Gathered materials	97
A.3.3	Liaisons from other TCs contributing to the smart grid requirements of the domain	100
Annex B (informative)	Use Cases	101
B.1	Distributed energy resources	101
B.2	Smart home/commercial/industrial/DR-customer energy management	109
B.2.1	Business Use Cases	109
B.2.2	System Use Cases	175
B.3	Energy storage	376
B.3.1	Business Use Cases	376
Bibliography	392
iTeh STANDARD PREVIEW (standards.iteh.ai)		
Figure 1	– Example of a hierarchical DER system five-level architecture.....	19
Figure 2	– DER primary stakeholders.....	20
Figure 3	– Traffic light concept.....	21
Figure 4	– Business policies, business objectives, business processes, and system use cases	22
Figure 5	– Role highlights of the smart home domain.....	44
Figure 6	– General architecture for the smart home	54
Figure 7	– General architecture for the smart building.....	55
Figure 8	– EES domains, services and roles	75
Figure A.1	– Reference architecture diagram for smart metering communications.....	94
Figure A.2	– EU M/490 – Flexibility Functional Architecture (CEN-CENELEC-ETSI).....	94
Figure A.3	– France – COSEI architectures	95
Figure A.4	– Correspondence table between hardware components and functional components (system roles).....	96
Figure B.1	– Level 1 DER systems with autonomous functions at facility and DSO sites	101
Table 1	– Content of IEC SRD 62913-2-3:2019.....	9
Table 3	– Matrix of stakeholders versus their primary business purposes	22
Table 4	– Types of DER services	24
Table 5	– Business roles.....	30
Table 6	– Business Use Cases	31
Table 7	– Identified system Use Cases of the domain	33
Table 8	– System roles of the domain	38
Table 9	– Business roles of the domain.....	43
Table 10	– Identified smart home business Use Cases of the domain	45

Table 11 – Identified smart building business Use Cases of the domain.....	46
Table 12 – Identified system Use Cases of the domain	48
Table 13 – System roles of the domain	53
Table 14 – Business requirements	55
Table 15 – Identified EES services	74
Table 16 – Business roles of the domain.....	78
Table 17 – Identified business Use Cases of the domain	79
Table 18 – Identified system Use Cases of the domain	81
Table 19 – Requirements extracted from EES Use Cases.....	82
Table A.1 – Existing User Stories.....	84
Table A.2 – Existing Use Cases	85
Table A.3 – IEC documents on smart home/commercial/industrial/ DR-customer energy management.....	87
Table A.4 – Existing User Stories.....	88
Table A.5 – Existing Use Cases	89
Table A.6 – Links between TC 57/WG 21 User Stories and SyC SE Use Cases	90
Table A.7 – Existing User Stories.....	93
Table A.8 – International Standards on energy storage.....	97
Table A.9 – Regional and/or organizational standards on energy storage	98
Table A.10 – Existing Use Cases on energy storage	99
Table A.11 – Existing Use Cases on energy storage	100
Table B.1 – DER Use Cases	102
Table B.2 – Adapt the smart home behaviour to the resident/client's preferences	109
Table B.3 – Enable the interoperability between the smart home and the smart grid	118
Table B.4 – Provide enriched smart home data to relevant parties in order to make the resident/client more active	126
Table B.5 – Manage the flexibility on electricity demand and generation within a smart home from market signals.....	134
Table B.6 – Adapt the smart building behaviour to the energy manager/client's preferences	142
Table B.7 – Provide enriched smart building data to relevant parties in order to make the energy manager/client more active.....	151
Table B.8 – Manage the flexibility on electricity demand and generation within a smart building from market signals	160
Table B.9 – Manage the flexibility in electricity demand and generation within a smart home from emergency signals	168
Table B.10 – Manage the flexibility of the smart home on electricity demand and generation from price incentives	175
Table B.11 – Manage the flexibility of the smart home on electricity demand and generation from DR requests	205
Table B.12 – Manage opt-outs of the smart home to automatic responses related to price incentives or DR requests	233
Table B.13 – Customize automatic responses of the smart home (price incentives, DR requests, or emergency signals)	247
Table B.14 – Provide a third party with enriched smart home electricity data	261
Table B.15 – Provide alarms related to the smart home electricity behaviour to the client or resident.....	278

Table B.16 – Manage the flexibility in electricity demand and generation within a smart home from emergency signals	287
Table B.17 – Manage the flexibility of the smart building on electricity demand and generation from price incentives	296
Table B.18 – Manage the flexibility of the smart building on electricity demand and generation from DR requests	306
Table B.19 – Manage opt-outs of the smart building to automatic responses related to price incentives or DR requests	316
Table B.20 – Customize automatic responses of the smart building (price incentives, DR requests, or emergency signals)	329
Table B.21 – Provide a third party with enriched smart building electricity data	344
Table B.22 – Provide alarms related to the smart building electricity behaviour to the client or energy manager	360
Table B.23 – Optimize the smart building behaviour regarding internal and external information received	369
Table B.24 – Contribute to the efficient integration of intermittent renewable energies in the electric power system.....	377
Table B.25 – Help the grid user or the grid operator improve the quality of supply	385

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[IEC SRD 62913-2-3:2019](https://standards.iteh.ai/catalog/standards/sist/0c6dde41-cb0b-450a-a8aa-526e4ee8c0c2/iec-srd-62913-2-3-2019)

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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
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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. <https://standards.iteh.ai/catalog/standards/sist/0c6dde41-cb0b-450a-a8aa-526e4ee8c0c2/iec-srd-62913-2-3-2019>
- 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

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3.1.10

electric power system

EPS

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

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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]