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TECHNICAL REPORT

colour inside

Power systems management and associated information exchange – Part 2: Use cases and role models

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Power systems management and associated information exchange – Part 2: Use cases and role models

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POWER SYSTEMS MANAGEMENT AND ASSOCIATED INFORMATION EXCHANGE –

Part 2: Use cases and role models

FOREWORD

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The main task of IEC technical committees is to prepare International Standards. However, a technical committee may propose the publication of a Technical Report when it has collected data of a different kind from that which is normally published as an International Standard, for example "state of the art".

IEC 62357-2, which is a technical report, has been prepared by IEC technical committee 57: Power systems management and associated information exchange.

The text of this Technical Report is based on the following documents:

DTR	Report on voting
57/2042/DTR	57/2066/RVDTR

Full information on the voting for the approval of this Technical Report 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 62357 series, published under the general title *Power systems management and associated information exchange*, 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- withdrawn,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 is in an operational implementation phase of the System approach of standardization. Technical Committee 57 (TC 57) has a crucial role in helping other Application Domain TCs extending their core standards (i.e. CIM standards/IEC 61850/IEC 62746/IEC 62351) to their specific domains. This should ensure efficient and secured power network management.

In the system approach working process, it is important for TC 57 to be able to consolidate, share and explain the numerous Use Cases serving as basis for its standardization work. These Use Cases are an excellent tool for design and implementation of new processes, also for external organisations (SDOs, User Groups, Alliances etc.)

The mission of this Technical Report is to list the Use Cases featured in the TC 57 standardization work, thus making them available for re-use in on-going and future work. Hopefully this will also promote Use Cases as a good tool for further work.

The intended audience for the document is the experts of TC 57 for their standardization work or experts of other Application Domain TCs for on-going standardization work, independently from TC 57 or through Joint Working Groups (JWG) or Task Forces (TF), as well as roadmaps and strategic vision through Ad-hoc Groups, Strategic Groups, System Evaluation Groups or System Committees.

This document structures and consolidates the TC 57 Use Cases (Status, WG and documents linked, roles used, roadmap) to facilitate their use and re-use. It will list the following elements:

- Existing Use Cases used to develop standards and their links with source documents, the IEC Status of this source document, a short Use Case description, its compliance to IEC 62559-2
- A roadmap: planned or drafted Use Cases (in on-going standardization work and PWI)
- Roles used in those Use Cases
- Terminology used in standardization work and not present in existing standards

This Technical report is split by active Working Group (WG) of TC 57

- WG 10 Power system IED communication and associated data models
- WG 13 Energy Management Systems Application Program Interfaces (EMS API)"
- WG 14 System interfaces for distribution management
- WG 15 Data and Communication Security
- WG 16 Deregulated Market Communications
- WG 17 Power system intelligent electronic device communication and associated data models for distributed energy resources and distribution automation
- WG 18 Hydroelectric power plants – Communication for monitoring and control
- WG 19 Interoperability within TC 57 in the long term
- WG21 Interfaces and protocol profiles relevant to systems connected to the electrical grid

POWER SYSTEMS MANAGEMENT AND ASSOCIATED INFORMATION EXCHANGE –

Part 2: Use cases and role models

1 Scope

This part of IEC 62357, which is a technical report, establishes the list of Use Cases developed by TC 57, Power systems management and associated information exchanges, in order to prepare International Standards, Technical Reports and Technical Specifications.

Use Cases are fundamental to TC 57 publications, as shown in Figure 1.

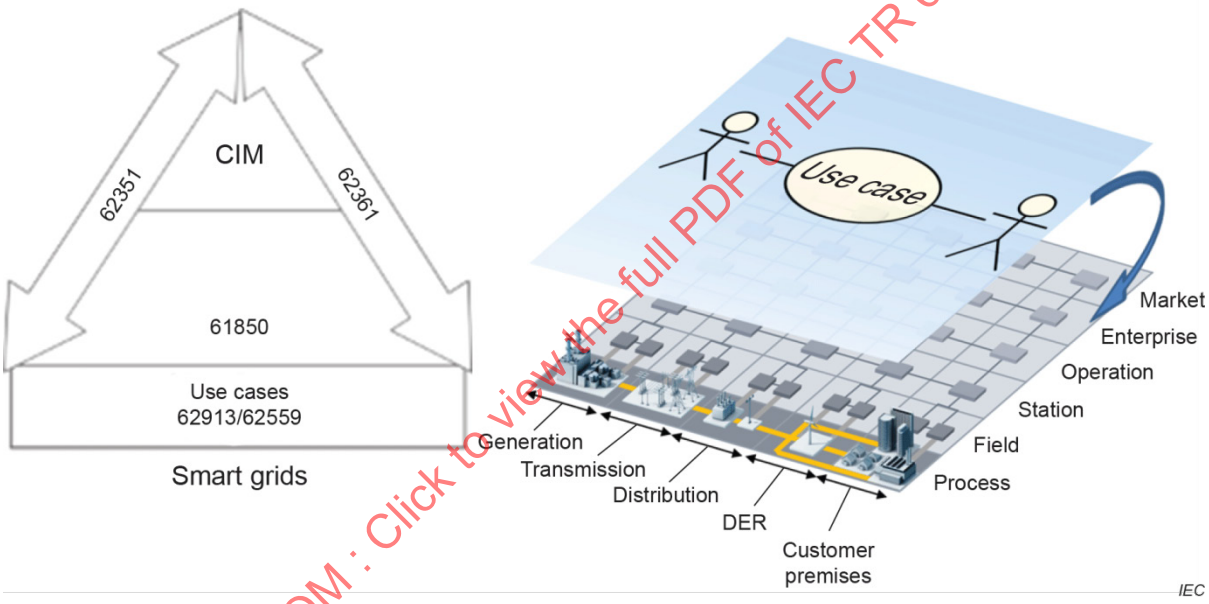

Figure 1 – TC 57 core standards

The Use Case creation process is shown in Figures 2, 3 and 4.

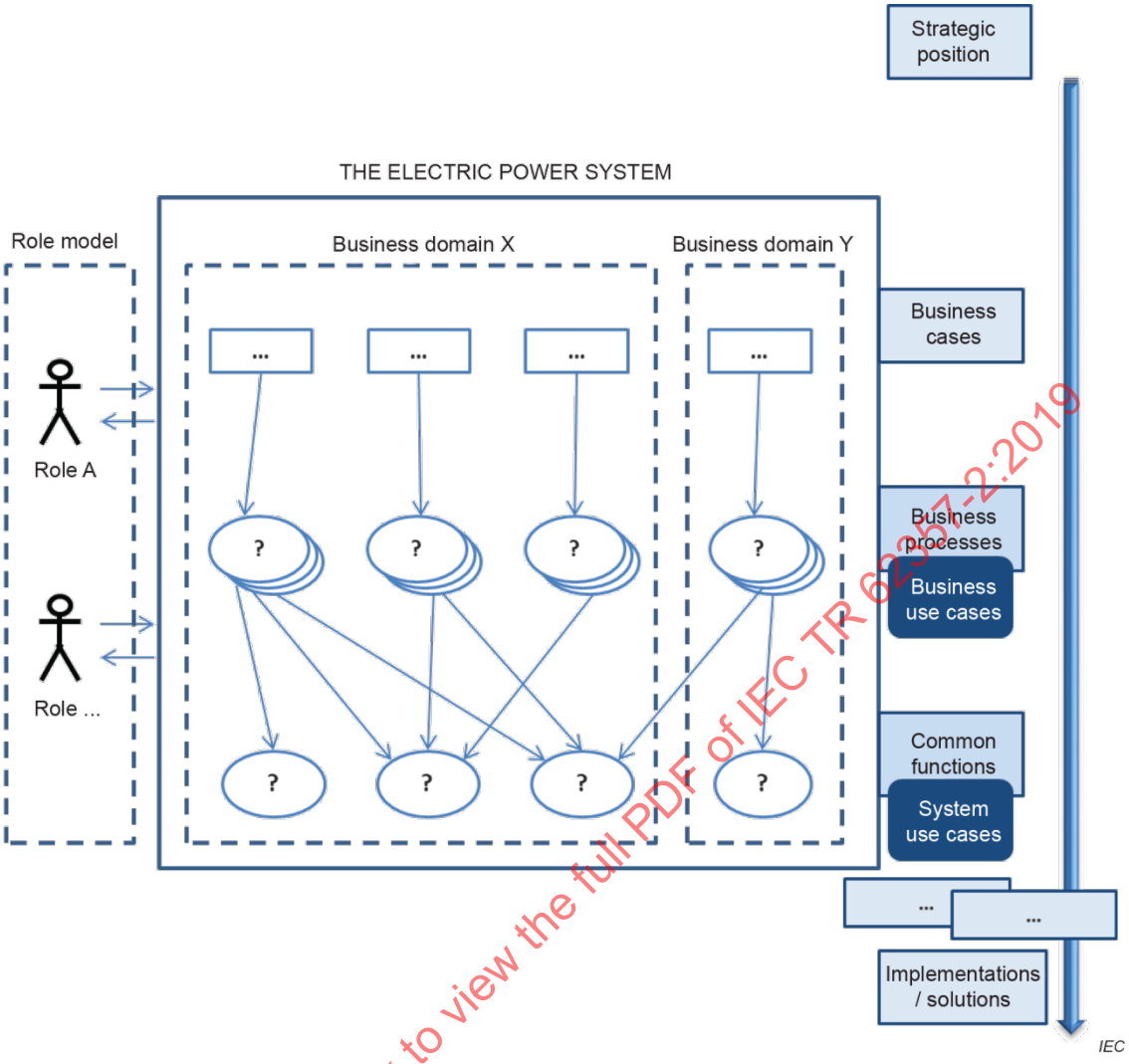

Figure 2 – UML-driven top/down approach supporting IEC 62559 and IEC 62913

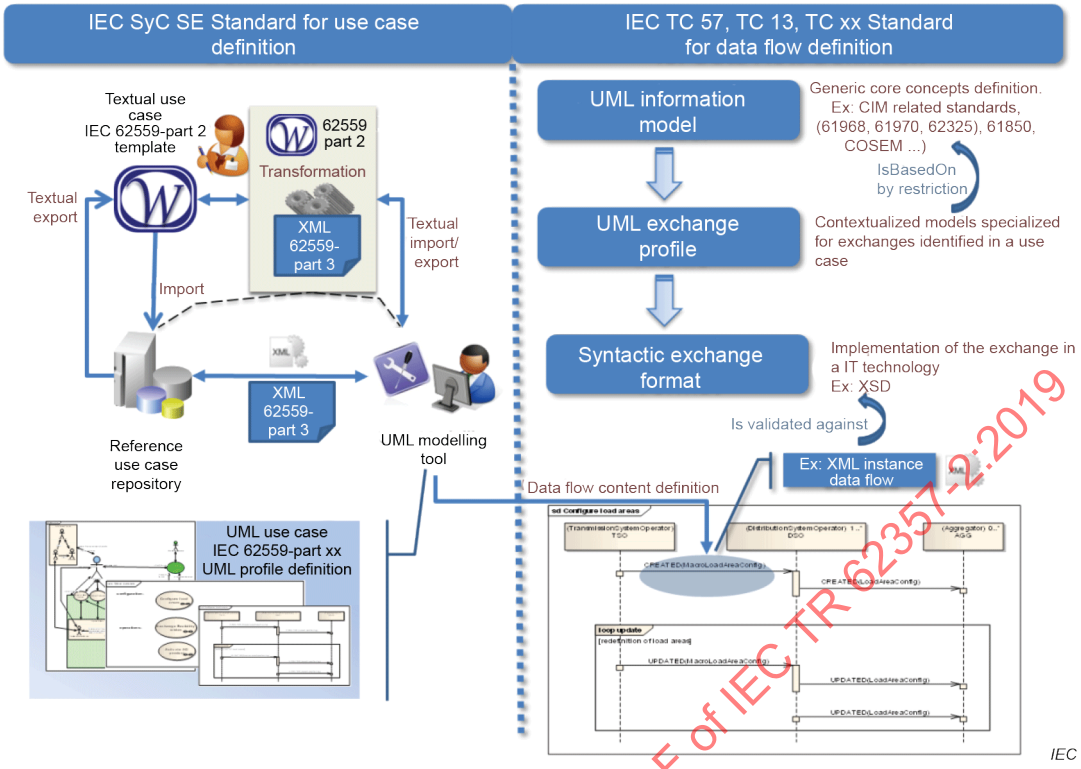

Figure 3 – Use Case design process

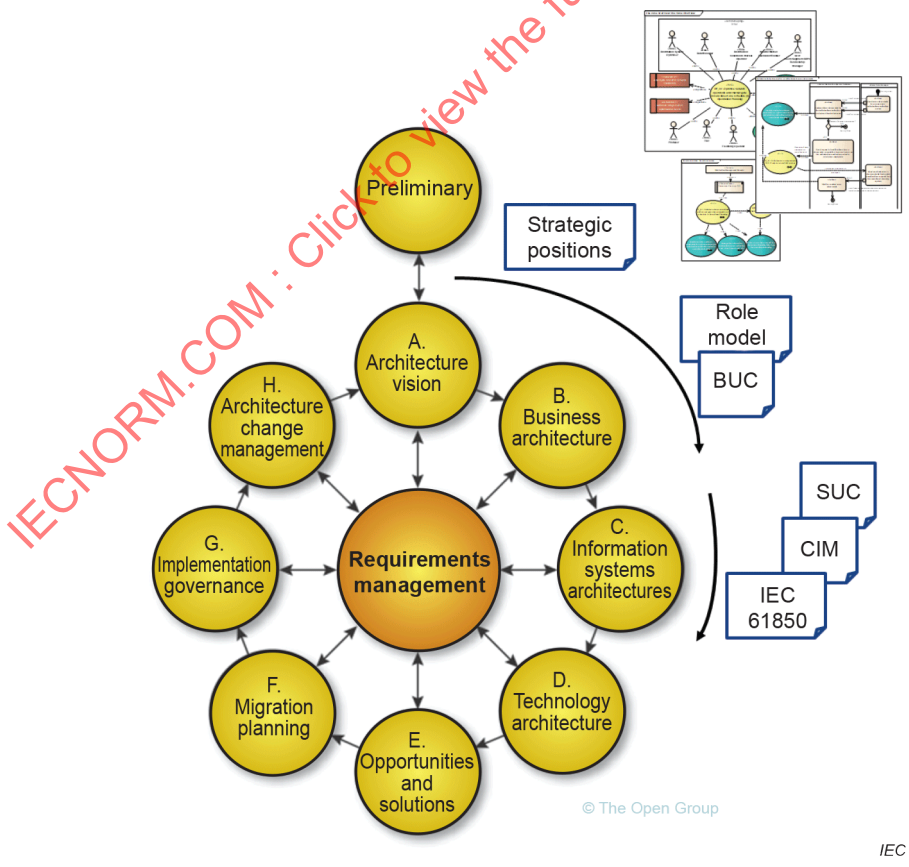

Figure 4 – Enterprise architecture and IEC core standards relationships

This Technical Report:

- Identifies in existing standards, technical specification, reports and in ongoing TC 57 work (CD, DTS, DTR etc.) the Use Cases used as well as their links to standards, their status as Use Cases (level of description, standardization of the description referring to IEC 62559) and as IEC deliverables (are they in a TR/TS/IS, what is the status of the document CD, CDV etc.)
- Helps System Committees consolidate Use Cases through terminology and term definition work (link with existing relevant standards on the TC Terminology) and building links between roles and modelling frameworks (Role models). For example in TC 57 building links between the Use Case methodology and the roles used in IEC 62913-2 with CIM Interface Reference Model (IRM – IEC 61968).
- Shares and promotes those Use Cases within TC 57 and outside it. TC 57 mainly describes System Use Cases in the standards it publishes. Business roles and business Use Cases are mainly described within SyC SE (System Committee Smart Energy) deliverables (IEC 62559 series and IEC 62913 series).
- This document provides good input in reusing System Use Cases and System Roles inside and outside TC 57.
- Explains the content of its Use Cases to potential users and providing support on using those Use Cases for standardization (Normative context, maturity of the Use Case, location in standardization work, roles implied)

Those Use Cases aimed to be used as tools to identify requirements as input to further development of technical standards (whether TC 57 or not) and improve the consistency in this work and in that way contribute to interoperability. Use Cases facilitate cooperation at a system level with TCs, other standards-developing organizations, non-traditional players of electrotechnology, and regional organizations. Inside the IEC they provide a convergence platform with overall system level value for support of the Technical Committees and other standard development groups.

This document allows TC 57 to self-assess its work on Use Cases through KPIs (Key Performance Indicator) such as:

- % of Use Cases compliant with IEC 62559-2
- % of Business Use Cases (BUC) and System Use Cases (SUC)
- % of Business Roles and System Roles
- % of non-defined roles

Another objective of this document is to fill up the TC 57 Use Case Repository, as shown in Figure 5.

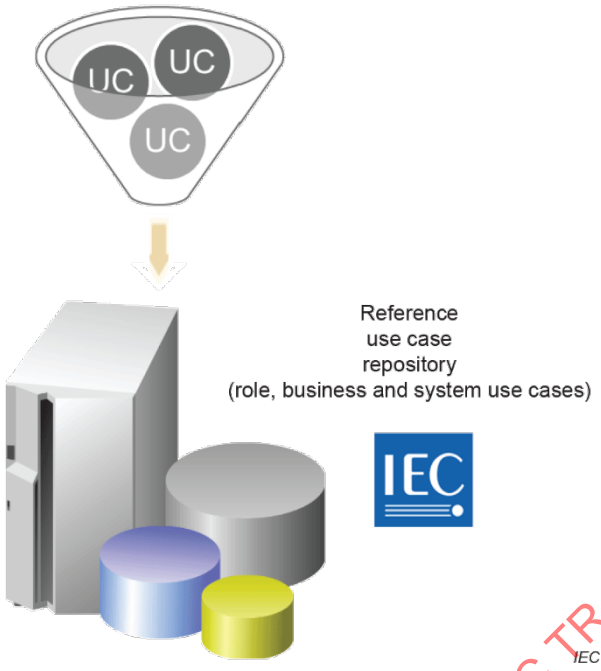

Figure 5 – Use Case Repository

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60870-5, *Telecontrol equipment and systems – Part 5: Transmission protocols*

IEC 60870-6, *Telecontrol equipment and systems – Part 6: Telecontrol protocols compatible with ISO standards and ITU-T recommendations*

IEC 61850 (all parts), *Communication networks and systems for power utility automation*

IEC 61968 (all parts), *Application integration at electric utilities – System interfaces for distribution management*

IEC 61970 (all parts), *Energy management system application program interface (EMS-API)*

IEC 62351 (all parts), *Power systems management and associated information exchange – Data and communications security*

IEC 62325 (all parts), *Framework for energy market communications*

IEC 62361 (all parts), *Power systems management and associated information exchange – Interoperability in the long term*

IEC 62559-2:2015, *Use case methodology - Part 2: Definition of the templates for use cases, actor list and requirements list*

IEC 62746 (all parts), *Systems interface between customer energy management system and the power management system*

IEC TS 62913-1, *Generic Smart Grid Requirements – Specific application of the Use Case methodology for defining Generic Smart Grid Requirements according to the IEC System approach*[1]

3 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
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 TS 62913-1 this term includes the concepts of Business Role and System Role involved in Use Cases.

[SOURCE: IEC 62559-2:2015]

3.2
business role
role describing a finite set of responsibilities that is assumed by a party (organizations, organizational entities or physical persons)

3.3
levels of maturity
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 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).

3.4
role
type of actor which has responsibilities and represents the external intended behavior of a party

EXAMPLE 1 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 TS 62913 uses two kinds of roles: Business Roles and System Roles.

[1] Under preparation. Stage at the time of publication: IEC/RPUB 62913-1:2019.

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

Note 3 to entry: Between Systems, Devices and Operators can be described or modelled as System Use Cases.

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

3.5
system role
role describing a finite set of functionalities that is assumed by an entity (devices, information system, equipment)

3.6
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

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

– 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 / 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 / facilitate more than one business process, a System Use Case can be linked to more than one Business Use Case.

Table 1 highlights the differences between these 2 types of Use Case.

Table 1 – Differences between Business and System Use Cases

Type of Use Case	Description	Actors 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)

4 Use case analytics

Table 2 gathers information that characterizes each WG's set of Use Cases.

Table 2 – Use Case analytics per Working Group

WG 10	232	98	9,27 %	5,6 % [a]	80,1 % [a]	228	9,65 % [a]	89,91 % [a]	16,23 %
WG 13	20	24	0 %	75 %	25 %	21	9,52 %	90,48 %	80,95 %
WG 14	72	98	12,5 %	1,39 %	98,61 %	63	25,40 %	74,60 %	20,7 %
WG 15	12	0	0 %	25 %	75 %	21	42,86 %	57,14 %	60,4 %
WG 16	59	10	1,7 %	100 %	0 %	23 / 37 [b]	100 %	0 %	0% / 64,9 % [b]
WG 17	38	3	0 %	0 %	100 %	21	14,29 %	85,71 %	14,3 %
WG 18	6	6	0 %	0 %	100 %	0	N/A	N/A	N/A
WG 19	7	3	28,6 %	0 %	100 %	17	23,53 %	76,47 %	5,9 %
WG21	55	47	100 %	1,8 %	98,2 %	23	21,74 %	78,26 %	0 %
JWG 11	8	0	100 %	75 %	25 %	9	44,44 %	55,56 %	0 %
Global	**509**	**289**	**19 %**	**19,25 %**	**74,2 %**	**464**	**26,94 %**	**73,06 %**	**23,49 %**

[a] The sum does not match 100 % because some Use Cases and roles of WG 10 can be classified as neither business nor system.

[b] The roles of WG 16 are divided between those from the eblX, EFET and ENTSO-E role model and the others, hence the two numbers that respectively characterize these two parts.

5 Use Cases and roles of TC 57 WG 10, Power system IED communication and associated data models

5.1 General

The scope of WG 10, *Power system IED communication and associated data models*, is to develop standards and technical reports related to the communication and data models of Power System IEDs, to take responsibility for the generic aspects of IEC 61850 and to coordinate with other WGs that are developing domain specific data models.

5.2 Documents used

IEC reference	Name	Publication status	Edition
61850-4	System and project management	Published	2
61850-6	Configuration description language for communication in electrical substations related to IEDs	Published	2
61850-7-4	Configuration description language for communication in power utility automation systems related to IEDs	Published	2
61850-7-500	Use of logical nodes for modeling application functions and related concepts and guidelines for substations	Published	1
61850-7-5	Use of logical nodes for modeling application functions and related concepts and guidelines for substations	PWI	1
61850-90-1	Use of IEC 61850 for the communication between substations	Published	1
61850-90-2	Using IEC 61850 for communication between substations and control centres	Published	1
61850-90-3	Using IEC 61850 for condition monitoring diagnosis and analysis	Published	1
61850-90-4	Network engineering guidelines	Published	1
61850-90-5	Use of IEC 61850 to transmit synchrophasor information according to IEEE C37.118	Published	1
61850-90-6	Use of IEC 61850 for Distribution Automation Systems	BPUB	1
61850-90-11	Methodologies for modeling of logics for IEC 61850 based applications	PWI	1
61850-90-14	Using IEC 61850 for FACTS (Flexible AC Transmission Systems) data modelling	PWI	1

IEC reference	Name	Publication status	Edition
61850-90-16	System management for IEC 61850	ACD	1
61850-90-17	Using IEC 61850 to transmit power quality data	Published	1
61850-90-18	Alarm Handling	PWI	1
61850-90-20	Guideline to redundancy systems	PWI	1
61850-90-21	Travelling Wave Fault Location	PWI	1

5.3 TC 57 WG 10 Use Case reporting

WG number of identified Use Cases	% of Use Cases described with 62559-2	% of Business Use Cases	% of System Use Cases	Number of roles identified			% of non-defined roles
232	**9,27 %**	**5,6 %**[a]	**80,1 %**[a]	**228**	9,65 %[a]	89,91 %[a]	**16,23 %**

[a] The sum does not match 100 % because some Use Cases and roles of WG 10 can neither be classified business or system.

5.4 TC 57 WG 10 List of Use Case per normative document

IEC document	Use Case Title	Pub. status	Description	Actors / Roles	IEC 62559-2 compliance
61850-4	***System and project management***	***Published***			
61850-4	System engineering process for designing and configuring an automation system	Published	Describes actors and tools	Project Requirement Engineer, Project Design Engineer, Manufacturer, System Integrator, IED parameterizing Engineer, Testing and Commissioning Engineer	
61850-4	Replacement of one IED with one coming from the same vendor	Published	Replacement of an IED due to device failure	IED, Vendor A	
61850-4	Replacement of one IED with one coming a different vendor	Published	Replacement of an IED due to device failure	IED, Vendor A, Vendor B	
61850-4	Extension with addition of one IED into an existing system	Published	Addition of a device	IED, Vendor A or B	
61850-4	Extension of the system with new functionalities	Published	UAS extension	IED, Vendor A or B	

IEC document	Use Case Title	Pub. status	Description	Actors / Roles	IEC 62559-2 compliance
61850-6	***Configuration description language for communication in power utility automation systems related to IEDs***	***Published***			
61850-6	Engineering process with System Configuration description Language	Published	Defines tool roles	IED Configurator, System Configurator	
61850-6	Engineering process with System Configuration description Language – system specification	Published	A system specification in terms of the single line diagram, and allocation of logical nodes (LN) to parts and equipment of the single line to indicate the needed functionality	IED Configurator, System Configurator	
61850-6	Engineering process with System Configuration description Language – process configuration	Published	Complete process configuration with all IEDs bound to individual process functions and primary equipment, enhanced by the access point connections and possible access paths in subnetworks for all possible clients	IED Configurator, System Configurator	
61850-6	Engineering process with System Configuration description Language – IED configuration	Published	The IED Configurator loads IED configuration into the IED	IED Configurator, System Configurator	

IEC document	Use Case Title	Pub. status	Description	Actors / Roles	IEC 62559-2 compliance
61850-6	Engineering process with System Configuration description Language – data exchange between projects	Published	As far as the engineering responsibility is concerned, a complete secondary system can be split into different parts. Examples include separate engineering of high-voltage level and medium-voltage level, of a transformer-related part, or even of different substations exchanging data e.g. for line protection or interlocking. For the purposes of this standard, such a system part with responsibility for all its contained IEDs is called a project. To allow the engineering of online communication data flow between such projects, some interfacing data has to be exchanged between the projects, and the engineered interfaces have to be reimported to the concerned projects.	IED Configurator, System Configurator	
61850-6	Engineering process with System Configuration description Language – IED modifications	Published	During the engineering process it may happen that the IED-related data has to be changed. This can in principle be done by removing the IED from the system, and reinstantiating a modified IED description file in the system. However, in this case also all existing references from or to the IED are lost and have to be re-established.	IED Configurator, System Configurator	
61850-7-4	***Basic communication structure – Compatible logical node classes and data object classes***	***Published***	***Functions are described in more detail in IEC 61850-7-500***		
61850-7-4	Substation control and supervision	Published	Implied		

IEC document	Use Case Title	Pub. status	Description	Actors / Roles	IEC 62559-2 compliance
61850-7-4	Substation bay process control	Published	Implied		
61850-7-4	Substation switch gear process control	Published	Implied		
61850-7-4	Protection relay and protection functions	Published	Implied		
61850-7-4	Metering and measurement	Published	Implied		
61850-7-4	Power Quality Monitoring	Published	Implied		
61850-7-500	***Use of logical nodes for modelling application functions and related concepts and guidelines for substations***	***Published***	***Functions are described in detail, but not modelled as Use Cases***		
61850-7-500	Control of switchgear	Published	The switchgear is basically represented by logical nodes XCBR or XSWI. The application of the time critical GOOSE service according to IEC 61850-8-1 is needed between the control (CSWI) and protection (Pxxx-PTRC) at bay level and the switchgear to operate or trip the switchgear. It refers for time-critical functions, also to the position indication from the switchgear.		

IEC document	Use Case Title	Pub. status	Description	Actors / Roles	IEC 62559-2 compliance
61850-7-500	Synchrocheck	Published	The synchrocheck allows closing of an open circuit breaker only if both the amplitudes, phase angles and frequencies of the voltage on both sides are within predefined intervals.		
61850-7-500	Interlocking	Published	The interlocking should forbid dangerous switching operations which may harm people or destroy equipment. The requirements are easily derived from the task and properties of the switches. Simple and common requirement examples are to avoid switching power to ground, creating a short circuit or breaking or connecting power by disconnectors which would destroy this kind of equipment.		
61850-7-500	Blocking	Published	By definition, blocking switching operations refers not to the condition of the rest of the switchgear but only to the behavior of the switch which is intended to be operated. There could be a mechanical problem with the operating mechanism, too low gas density or not enough drive energy. The blocking of switchgear could be also issued by an operator command to the X-nodes by the DO BlkOpn and BlkCls.		

IEC document	Use Case Title	Pub. status	Description	Actors / Roles	IEC 62559-2 compliance
61850-7-500	Operation 1 out of n	Published	If more than one switch is operated at once, then overlapping of contact movement with dangerous power transfer may happen. Unpredictable transient events may occur. Therefore, as a general rule in most substations, only one of the switches should be operated at same time, at least in interconnected parts of the substation.		
61850-7-500	Control authority management	Published	Control actions in a substation may be accomplished at different control levels. For safety reasons, an operator or service person if applicable shall be able to isolate a level from the others by claiming the control authority for that level.		
61850-7-500	Protection	Published	The bay protection (Protection IED) is connected to the station level and other bays (if applicable) by the station bus providing communication over Ethernet. The bay protection is hardwired (parallel copper wires) to the switchgear (process). External process states and measured values are converted to data according to the IEC6 1850 data model in the Protection IED. Therefore, the boundary LNs are all in this IED. The switchgear is shown as single phase switches.		

IEC document	Use Case Title	Pub. status	Description	Actors / Roles	IEC 62559-2 compliance
61850-7-500	Point on wave switching	Published	Point-on-wave switching (also known as controlled switching or synchronous switching) means to open or close the circuit breaker at a predefined instant of time i.e. at a certain value of the sinusoidal current or voltage.		
61850-7-500	Breaker failure protection	Published	Since also in three-phase breakers differences in the pole positions per phase may happen, the modeling of supervision requests three instances of XCBR. The common XCBR reports the phase discrepancy if any. The trip may be performed for all three phases (three-phase trip) or per phase (single phase tripping), which is very common at higher voltage levels e.g. to keep the power system synchronization.		
61850-7-500	Line differential protection (see as well 61850-90-1)	Published	The current differential protection (LN PDIF, one instance per phase) checks that the currents on both or more sides of the protected object are the same disregarding the sign, i.e. under no fault conditions the sum of the currents is zero according to the Kirchhoff law.		
61850-7-500	Line distance protection with teleprotection schemes (see as well IEC 61850-90-1)	Published	The distance protection PDIS (one instance per zone) measures current and voltage (TCTR, TVTR) at one side of the line and permanently calculates the impedance. The impedance is calculated in different zones.		

IEC document	Use Case Title	Pub. status	Description	Actors / Roles	IEC 62559-2 compliance
61850-7-500	Autorecloser	Published	In case of transient faults, after the trip by protection (LN Pxxx) the auto recloser (LN RREC) shall try to close the tripped circuit breaker as fast as possible with some boundary conditions to minimize the interruption on power delivery. RREC will make a predefined number of reclosing cycles (e.g. 3) but declare the fault permanent if this number of trials is exhausted. For a more detailed description of this LN, see IEC 61850-5.		
61850-7-500	Switch on to fault	Published	If the circuit breaker is open for some time, it is often not clear what is with the network conditions on both side of the breaker. It could be that one side is connected to earth and the other one to power. Then, closing will create a short circuit. The protection should switch off this short circuit without any delay e.g. between start and trip. Another problem is to distinguish between a short circuit and the high current which is loading up the capacities of an overhead grid or cable grid part after a black-out.		
61850-7-500	Operation of parallel transformers	Published			
61850-7-500	Reverse blocking	Published	The reverse blocking function is applied in case of a unidirectional (radial) power flow from typical one infeed to many loads and implements some kind of a simple busbar protection based on overcurrent protection.		

IEC document	Use Case Title	Pub. status	Description	Actors / Roles	IEC 62559-2 compliance
61850-7-500	Load shedding	Published			
61850-7-5	***Use of logical nodes for modeling application functions and related concepts and guidelines for substations***	***PWI***			
61850-7-5	Busbar change-over	PWI	An outgoing line is supplied from busbar 1 of a double busbar substation. This line shall be changed over to busbar 2 without interrupting the supply.	Network Operator	
61850-7-5	The IED is restarted	PWI			
61850-7-5	Another setting group is activated	PWI			
61850-7-5	LD Beh or LN Mod are changed	PWI			
61850-7-5	Sequence using UC "Another setting group is activated" and "LD Beh or LN Mod are changed"	PWI			

IEC document	Use Case Title	Pub. status	Description	Actors / Roles	IEC 62559-2 compliance
61850-90-1	***Use of IEC 61850 for the communication between substations***	***Published***			
61850-90-1	Distance line protection with permissive overreach tele-protection scheme	Published	When a distance relay detects a forward fault in the overreach zone, it sends a permissive signal to the remote end. If that relay also receives a permissive signal (from the remote end), the relay sends a trip signal to the local CB.	Measuring equipment, Comm. I/F –S, Comm. I/F –R, CB	
61850-90-1	Distance line protection with blocking overreach tele-protection scheme	Published	When a distance relay detects reverse faults, it sends a blocking signal to the remote end. If the relay detects a forward fault and does not receive the blocking signal, the relay sends a trip signal to the local CB. A variant involves the directional comparison blocking (DCB) using a non-directional element to send a blocking signal for any fault (other wording: "starts the carrier"). The operation of the forward element removes the blocking signal ("stops the carrier") and sends a trip signal to the local CB.	Measuring equipment, Comm. I/F –S, Comm. I/F –R, CB	
61850-90-1	Directional comparison protection	Published	When a directional relay (typically a directional overcurrent relay) detects a forward fault, the relay sends a permissive signal to the remote end. If the relay also receives a permissive signal from the remote end, the relay sends a trip signal to the local CB.	Measuring equipment, Comm. I/F –S, Comm. I/F –R, CB	

IEC document	Use Case Title	Pub. status	Description	Actors / Roles	IEC 62559-2 compliance
61850-90-1	Transfer/Direct tripping	Published	Local equipment sends a trip command to the remote equipment. This function is sometimes called inter-tripping as well.	Commander, Comm. I/F –S, Comm. I/F –R, CB	
61850-90-1	Interlocking	Published	The interlocking of the line earth switch depends on whether there is voltage on the line or not. To be able to detect this, the states of the earthing switch, and the line disconnector switch of the other line side, should be transferred and used. The method of under-voltage measurement may still be considered as back-up functionality in case of losing the communication link.	Switch state acquisition, Comm. I/F –S, Comm. I/F –R, Interlocking Controller	
61850-90-1	Multi-phase auto-reclosing application for parallel line systems	Published	Multi-phase auto-reclosing (1-phase, 2-phase, 3-phase) is a scheme that is applied to the double line circuit. In multi-phase auto-reclosing applications, the scheme decides its actions based on CB status of the remote end (not usually used for other auto-reclosing methods). This Use Case focuses on how to use or how to transmit CB status information for multi-phase auto-reclosing. Normal auto-reclosing processes (e.g. checking dead time etc.) are omitted in the explanation.	Protection relay, Comm. I/F –S, Comm. I/F –R, CB	

IEC document	Use Case Title	Pub. status	Description	Actors / Roles	IEC 62559-2 compliance
61850-90-1	Current differential line protection	Published	Current differential relays measure the current of the protected line at both ends. A local relay sends the current data (Ia) to the remote end and receives the current data from the remote end (Ib). Current differential relays detect faults in the protected line (internal faults) by comparing the current from the remote relay with the current of the local terminal. When current differential relays detect an internal fault, they send a trip signal to the local circuit breaker.	Measuring equipment, Comm. I/F –S, Comm. I/F –R, CB	
61850-90-1	Phase comparison protection	Published	When a phase comparison relay detects a positive current, above a set threshold, the relay sends an "on" signal to the remote end. The relay compares the local data signal with that from the remote end. If the time that both signals are "on" is very short, the phases of the currents detected by both ends are opposite and the relay restrained. If the time is sufficiently long, the relay recognizes there is an internal fault and sends a trip signal to the local CB.	Measuring equipment, Comm. I/F –S, Comm. I/F –R, CB	
61850-90-1	Fault locator system (2, 3 terminals)	Published	By using all terminal information, precise estimation of the fault location is possible. The voltages and currents of all ends are necessary.	Measuring equipment, Comm. I/F –S, Comm. I/F –R	

IEC document	Use Case Title	Pub. status	Description	Actors / Roles	IEC 62559-2 compliance
61850-90-1	System integrity protection schemes (SIPS)	Published	The described system integrity protection scheme comprises remote terminal units (RTU) and central equipment (CE). Remote terminal units are located at power stations and measure voltage. These remote terminal units periodically send measured data to the central equipment. The central equipment calculates the differences of the voltage angles between the western generators and the other generator groups (northern group, eastern group and south-eastern group), and also estimates the future angle differences. If the central equipment predicts that the generators will lose synchronisation, the central equipment sends a trip signal to the circuit breaker of the tie line.	Measuring equipment, Comm. I/F –S-RT, Comm. I/F –R-RT, Comm. I/F –S-CE, Comm. I/F –R-CE, CB	
61850-90-1	Real time predictive generator shedding	Published	This wide area protection system comprises remote terminals and central equipment. Remote terminal A and B measure the voltage and current at power station A and B. These remote terminals periodically send the active power, which is calculated from the voltage and current, to the central equipment. Remote terminal C sends voltage data to the central equipment. When a fault occurs, if the central equipment predicts that the generators will lose synchronisation, the central equipment sends a trip signal to the generators.	Measuring equipment, Comm. I/F –S-RT, Comm. I/F –R-RT, Comm. I/F –S-CE, Comm. I/F –R-CE, CB	

IEC document	Use Case Title	Pub. status	Description	Actors / Roles	IEC 62559-2 compliance
61850-90-1	Out-of-step detection	Published	By comparing the angle of voltage between the two ends, it can be detected whether the centre of the out-of-step is between the two ends or not. When the two voltages are in the opposite direction, an out-of-step occurs and the centre of out-of-step is in between the two ends.	Measuring equipment, Comm. I/F –S, Comm. I/F –R, CB	
61850-90-1	Remedial action schemes (RAS)	Published	Remedial action schemes (RAS) are designed to monitor and protect electrical systems. They perform automatic switching operations in response to adverse network conditions to ensure the integrity of the electrical system and to avoid a collapse of the network.	Central Controller	
61850-90-2	***Using IEC 61850 for communication between substations and control centrees***	***Published***			
61850-90-2	Telecontrol – Supervisory Control and Data Acquisition	Published	Contains sub-Use Cases, presented below	Control Centre, IED	
	Acquisition of status		*IED acquires the current status of a power system device (e.g. open, close...) and, if it has changed, sends the new status, cause of transmission, time stamp, etc., to the control centre.*		

IEC document	Use Case Title	Pub. status	Description	Actors / Roles	IEC 62559-2 compliance
	Acquisition of measurement		• *Sending Measurement on change IED acquires measurement (P, Q, I, V...) and, if it changed significantly (using dead band), sends it to the control centre.* • *Sending measurement cyclically IED acquires measurement (P, Q, I, V...) and sends it, cyclically (user configured), to the control centre.*		
	Acquisition of alarms		*IED receives alarms from substation equipment and sends them to the control centre.*		
	Remote control		• *Sending a direct command Control centre sends a command to a power system device to change its current position.* • *Sending a SBO command Control centre sends a command to a power system device to change its current position using SBO functionality.*		
	Sending setpoint		*Control centre sends a setpoint to a generator or to a tap changer transformer or FACTS*		
	General interrogation		*Control centre issues a request to refresh the control centre database image of substation information.*		
	Control authority management		*Isolation of remote control for maintenance purposes.*		

IEC document	Use Case Title	Pub. status	Description	Actors / Roles	IEC 62559-2 compliance
	Telemonitoring blocking		*Temporarily disable the update of information from the substation, or a part of it, to the control centre.*		
61850-90-2	Telecontrol – Supervisory Control and Data Acquisition	Published	Synchrophasor communication can be used within a substation for synchrocheck or substation level state estimation, as well as between several substations and a centre which performs regional or network level alarms and stability calculations. Subclause 5.3.3 describes only those Use Cases which require a communication to a centre. The transmission of synchrophasor information is defined in detail in IEC TR 61850-90-5:2012.	Maintenance centre, Storage device	
61850-90-2	Disturbance Records	Published	Contains sub-Use Cases, presented below	Maintenance centre, Storage device	
	Getting list of disturbance or fault records		*After received request from maintenance centre storage device sends the list of available disturbance or fault records. At least, the list should indicate for each file:* • *the concerned high voltage device,* • *the first sample time stamp,* • *the duration (disturbance records).*		
	Getting disturbance or fault records corresponding to a given period of time		*The maintenance centre sends a request including a given period of time to the storage device in order to get disturbance or fault records. Once received, the storage device sends related information.*		

IEC document	Use Case Title	Pub. status	Description	Actors / Roles	IEC 62559-2 compliance
	Getting disturbance or fault records for one given device		*The maintenance centre sends a request including one given high voltage device in order to get disturbance or fault records. Once received, the storage device sends related information.*		
	Sending disturbance or fault records		*The storage device sends disturbance or fault records to the maintenance centre.*		
	Getting configuration recording parameters		*After request from the maintenance centre, the storage device sends configuration recording parameters.*		
	Setting configuration recording parameters		*The maintenance centre sends configuration recording parameters to storage device.*		
61850-90-2	Metering	Published	Contains sub-Use Cases, presented below	User, Meter	
	Acquisition of integrated totals		*Memorization of integrated totals and transmission to the maintenance centre.*		
	Acquisition of incremental information		*Memorization of integrated totals; reset of the integrated totals and transmission to the maintenance centre.*		
	Request counting information		*Memorization of integrated totals or incremental information. Locally stored in the device. Transferred to the maintenance centre on request.*		
61850-90-2	Power Quality Monitoring	Published	Contains sub-Use Cases, presented below	IED, User	

IEC document	Use Case Title	Pub. status	Description	Actors / Roles	IEC 62559-2 compliance
	Request for power quality information		*After received request from control centre and/or maintenance centre, IED sends the right information to the user*		
	Retrieve LOG of power quality information		*Historic power quality information that has been stored in the IED can be retrieved on request of the control centre.*		
	Sending of power quality information		*Power quality information measured/calculated in the IED will be transferred to the user spontaneously*		
61850-90-2	Remote parameter and configuration changes	Published	Contains sub-Use Cases, presented below	IED, Maintenance centre	
	Request for configuration files		*After receiving request from maintenance centre, IED sends configuration files.*		
	Sending configuration files		*Maintenance centre sends configuration files to IED*		
	Request for operational parameters		*After received request from maintenance centre, IED sends current operational parameters.*		
	Setting operational parameters		*Maintenance centre sends operational parameters to IED then IED validates new parameters. IED sends an acknowledgement after having successfully activated new parameters.*		

IEC document	Use Case Title	Pub. status	Description	Actors / Roles	IEC 62559-2 compliance
61850-90-2	Asset management information	Published	After received request from maintenance centre, IED sends the requested information.	IED, Maintenance centre	
61850-90-3	***Using IEC 61850 for condition monitoring diagnosis and analysis***	***Published***			
61850-90-3	GIS SF6 monitoring	Published	The goal of the Monitoring is to detect leakages in an early stage. In case of a leakage it notifies maintenance planning. Furthermore it gives additional information to support repair works.	Gas Sensor, PD sensor, UHF Sensor, Other Sensors, Maintenance Worker, Maintenance Planner, Asset Manager	
61850-90-3	Circuit breaker abrasion monitoring	Published	Goal of abrasion monitoring is to calculate the effective wear on the main contacts, especially for circuit breakers.	Primary Current Sensor, Travel Sensor, Other Sensors (e.g. primary voltage), Maintenance Worker	
61850-90-3	Switch monitoring	Published	Switch monitoring allows the user to detect abnormal conditions on the switch before a regular maintenance is carried out. Furthermore it provides information to support maintenance planning.	Switch, Travel Sensor, Other Sensors (e.g. for motor current), Maintenance Worker	

IEC document	Use Case Title	Pub. status	Description	Actors / Roles	IEC 62559-2 compliance
61850-90-3	GIS maintenance	Published	Maintenance occurs typically at a periodic timebase or – at the best – the equipment itself calls for maintenance. Goal of the maintenance planning is to optimize the maintenance schedule based on the condition on several components inside the substation. Additionally the Monitoring System supports repair work by providing additional information.	Maintenance Worker, Maintenance Planner	
61850-90-3	ERP (Enterprise Resource Planning) update	Published	Goal of an ERP calculation is to estimate the remaining investment value of the substation. The calculation itself is carried out using specialized software. The monitoring system may provide information to update the ERP system based on the actual status.	ERP System	
61850-90-3	Operating mechanism monitoring	Published	Operating mechanism is mainly intended to help the operator to check the equipment's operating status.	Energy Sensor, Hydraulic Level Sensor, Hydraulic Temperature Sensor, Motor Current Sensor, Humidity Sensor, Hydraulic Pressur Sensor, Hydraulic Pump Sensor, Switch Position, Operator, Maintenance Worker	
61850-90-3	Maintenance planning (for operating mechanism)	Published	Maintenance planning is mainly intended to calculate time to maintenance.	Maintenance Worker	

IEC document	Use Case Title	Pub. status	Description	Actors / Roles	IEC 62559-2 compliance
61850-90-3	Operating mechanism monitoring for POW switching	Published	In the point-on-wave switching the phases are independently operated at the most favorable time instant. This results in better power quality and reduces the electrical stresses on the equipment which in turn allows for longer maintenance intervals. Specific monitoring information for process control is required to predict the operating time of the circuit breaker considering the parameters that have impact on CB closing/opening time. Specific monitoring information such as operation count comes from the CMD that are not the goal of this part of IEC 61850. Circuit breaker operating monitoring is intended to help the operator or the maintenance worker to predict operating time.	Coil Voltage, Hydraulic Pressure Sensor, Drive Temperature, Switch Position, Operator, Maintenance Worker, Configuration management, Travel Sensor	
61850-90-3	Transformer: Dissolved gas and moisture in oil supervision	Published	Dissolved Gas Analysis (DGA) is considered by most transformer experts as the single most important technique for CMD in transformers. It detects problems mainly in the core and coil components of the transformer. Online DGA is now very popular and adopted worldwide for transformers ranging from large transmission substations to smaller distribution. Several manufacturers offer products that measure from a single key gas to all combustible gases. A good percentage of online DGA analyzers available also measure relative humidity. Rate of change of gas concentrations is considered a very important indicator.	Dissolved gas and moisture sensor, Relative Humidity Sensor, Oil Temperature Sensor, Asset Management, Operation, Configuration Management	

IEC document	Use Case Title	Pub. status	Description	Actors / Roles	IEC 62559-2 compliance
61850-90-3	Transformer: Partial discharge (PD) supervision	Published	Various users prefer to use partial discharge analysis instead of online DGA. Others combine both techniques when monitoring critical transformers. There are different techniques for detection of PD: acoustic detection and electric detection. PD detects problems in the core and coil and bushing components of the transformer. Several manufacturers offer products that measure and analyze PD in the transformer.	Partial Discharge Sensor, Asset Management, Operation, Configuration Management	
61850-90-3	Transformer: Temperature supervision	Published	Most transformer components and sub-components are greatly affected by temperature. Higher temperatures will cause an accelerated aging of the transformer and a much higher risk of failure.	Direct Winding Temperature Sensor, Load Current Sensor, Top Oil Temperature Sensor, Bottom Oil Temperature Sensor, Asset Management, Operation, Configuration Management	
61850-90-3	Transformer: Solid insulation aging supervision	Published	Contrary to oil aging, solid insulation aging is an irreversible process due to the degradation of cellulose, which is the basic material of paper and barriers. This aging depends on several factors such as oil and winding temperature, moisture and presence of oxygen. It is very easy to measure moisture in oil but it is very unpractical, if not impossible, to measure online the moisture content in the paper or in the barriers. Calculations are required to obtain those values.	Bottom Oil Temperature Sensor, Relative Humidity Sensor, Winding Hot Spot Temperature, Asset Management, Operation, Configuration Management	

IEC document	Use Case Title	Pub. status	Description	Actors / Roles	IEC 62559-2 compliance
61850-90-3	Transformer: Bubbling temperature supervision	Published	Bubbling is very dangerous for the integrity of the transformer and should be avoided. Bubbling is affected by moisture in the transformer and by the transformer temperature. The bubbling threshold temperature can be calculated for given moisture conditions.	Relative Humidity Sensor, Oil Temperature Sensor, Winding Hot Spot Temperature, Asset Management, Operation, Configuration Management	
61850-90-3	Transformer: Bushing supervision	Published	Bushing failures are responsible for a very large number of transformer failures. The use of bushing monitoring is increasing. There are different techniques; other than PD method already described, the most popular are the monitoring of tan δ, sum of currents, bushing capacitance.	Current Sensor, Voltage Sensor, Asset Management, Operation, Configuration Management	
61850-90-3	Transformer: Cooling supervision	Published	High temperatures will cause aging acceleration in the transformer. Loading capacity is also affected by high temperatures. Moreover the peak load period occurs during summer in various countries. Cooling is then a very important component of a transformer. Its efficiency can be calculated by using a thermal model and also banks, pumps and fans can be monitored for various conditions.	Load Current Sensor, Ambient Temperature Sensor, Top Oil Temperature Sensor, Cooling Bank Status Sensor, Pump/fan Current Sensor, Asset Management, Operation, Configuration Management	

IEC document	Use Case Title	Pub. status	Description	Actors / Roles	IEC 62559-2 compliance
61850-90-3	Transformer: Ancillary sensors supervision	Published	There are several other ancillary sensors in transformers. Their uses vary according to the design, size, age and other factors.	Buchholz Relay, Oil Level Sensor, Pressure Sensor, Conservator Membrane Rupture Detector, Asset Management, Operation, Configuration Management	
61850-90-3	Load Tap Changer: Monitoring operation property	Published		Motor-Driving Current Sensor, Torque Sensor, Tap Position Sensor, LTC Operation Signal Sensor, Equipment Supervision, Maintenance Planning Support, Asset Management	
61850-90-3	Load Tap Changer: Monitoring operation counts	Published		LTC Operation Signal Sensor, Equipment Supervision, Maintenance Planning Support, Asset Management	

IEC document	Use Case Title	Pub. status	Description	Actors / Roles	IEC 62559-2 compliance
61850-90-3	Load Tap Changer: Monitoring contact abrasion	Published		Load Current Sensor (CT Sensor in bushing), LTC Operation Signal Sensor, Equipment Supervision, Maintenance Planning Support, Asset Management	
61850-90-3	Load Tap Changer: Monitoring LTC oil temperature	Published		LTC Oil Temperature Sensor, Transformer Oil Temperature Sensor, LTC Oil Flow Relay, Equipment Supervision, Maintenance Planning Support, Asset Management	
61850-90-3	Load Tap Changer: Monitoring operation of oil filter unit	Published		OFU (Oil Filter Unit) Operation Signal Sensor, Equipment Supervision, Maintenance Planning Support, Asset Management	
61850-90-3	Underground cable: Thermal aging supervision	Published		Temperature Sensor, Equipment Supervision, Maintenance Planning Support, Asset Management	

IEC document	Use Case Title	Pub. status	Description	Actors / Roles	IEC 62559-2 compliance
61850-90-3	Underground cable: Supervision of cable parts cracking	Published	The length of UGC varies according to its temperature, so that a force is applied to parts of a cable such as connection. If a force exceeds the proof strength of cable parts, they are cracked. Cable displacement is thought to have a relation to a force applied to a cable.	Position Sensor, Equipment Supervision, Maintenance Planning Support, Asset Management	
61850-90-3	Underground cable: Insulation aging supervision	Published		Partial Discharge Sensor, Voltage Sensor, Current Sensor, Equipment Supervision, Maintenance Planning Support, Asset Management	
61850-90-3	Underground cable: Water-tree supervision	Published		Current Sensor, Equipment Supervision, Maintenance Planning Support, Asset Management	
61850-90-3	Underground cable: Supervision of earth fault without circuit breaker trip	Published		Current Sensor, Voltage Senor, Equipment Supervision, Maintenance Planning Support, Asset Management	

IEC document	Use Case Title	Pub. status	Description	Actors / Roles	IEC 62559-2 compliance
61850-90-3	Underground cable: Oil aging supervision	Published		Gas Sensor, Equipment Supervision, Maintenance Planning Support, Asset Management	
61850-90-3	Underground cable: Oil leak supervision	Published		Oil Pressure Sensor, Oil Level Sensor, Temperature Sensor, Equipment Supervision, Maintenance Planning Support, Asset Management	
61850-90-3	Transmission line: Line condition supervisor	Published	The line condition server collects line condition data from sensors. The line condition server (LCS) diagnoses the status of the transmission line by comparing collected and processed data with predefined setting values. If a violation of the predefined setting value is found, the line condition server sends an alarm event and statistical data to the NCC/RCC.	Line Sensor, Meteorological Sensor, Configuration Management, Asset Management	

IEC document	Use Case Title	Pub. status	Description	Actors / Roles	IEC 62559-2 compliance
61850-90-3	Transmission line: Tower condition supervisor	Published	The tower condition server collects tower condition data from sensors. The tower condition server (TCS) diagnoses the status of the transmission tower by comparing collected and processed data with the predefined setting value. In case of the predefined setting value being violated, the tower condition server sends an alarm message and statistical data to the operation centre (NCC/RCC).	Meteorological Sensor, Tension Sensor, Inclination Sensor, Configuration Sensor, GPS Sensor, Configuration Management, Asset Management	
61850-90-3	Transmission line: Insulator condition supervisor	Published	The insulator condition server collects insulator related data from sensors. The insulator condition server (ICS) diagnoses the status of insulator by comparing collected and processed data with predefined setting values. In case of a violation of the predefined setting value, the insulator condition server sends an alarm event and statistical data to the operation centre (NCC/RCC).	Meteorological Sensor, Partial Discharge Sensor, Temperature Sensor, Current Leakage Sensor, Configuration Management, Asset Management	
61850-90-3	Transmission line: Surrounding area supervisor	Published	The surrounding area server sends a fire alarm message to the operation centre (NCC/RCC) on detecting the fire through the fire sensor.	Fire Sensor, Image Sensor, Configuration Management, Asset Management	

IEC document	Use Case Title	Pub. status	Description	Actors / Roles	IEC 62559-2 compliance
61850-90-3	Auxiliary power system supervision	Published	The typical auxiliary power system we have considered in this section: • Secured DC system from AC input power • Secured AC system from DC input with AC backup • Secured AC system from AC input with AC backup These three cases cover the most common cases of producing auxiliary power in Power Utility Automation	Main Power Input, Backup Power Input, Power Source Switches, Power Storage, Power Auxiliary Loads, Remote Operators	

IEC document	Use Case Title	Pub. status	Description	Actors / Roles	IEC 62559-2 compliance
61850-90-4	***Network engineering guidelines***	***Published***			
61850-90-4	Separated station bus and process bus rings	Published	This is a Use Case that combines a station bus network and a process bus network as rings. Separation of station bus and process bus rings avoids flooding the station bus with high traffic generated by SV publishers such as merging units. The IEDs have separate ports for station bus and for process bus. The internal implementation of both interfaces in each IED is vendor specific. The two interfaces of the IED shall not bridge frames, since this would create loops in the network. If they would bridge the bus – assuming they implement RSTP on both the station bus and/or process bus side, these integrated bridges would couple the process bus and the station bus rings and increase reconfiguration time possibly beyond tolerable values. This network setup effectively separates the station bus and process bus into two completely separate physical networks. To enable a reach-through (if needed) from the SCADA, engineering or other layer 3 application to devices on the process bus , e.g. the MUs, an IP router connects the two layer 2 networks through a layer 3 connection. The connections of the router into the two LANs and the router can be designed redundantly (utilizing e.g. the Virtual Router Redundancy Protocol VRRP) to provide fault tolerance, if desired. Alternatively, multicast filtering bridges can be used.	IED	

IEC document	Use Case Title	Pub. status	Description	Actors / Roles	IEC 62559-2 compliance
61850-90-5	***Use of IEC 61850 to transmit synchrophasor information according to IEEE C37.118***	***Published***			
61850-90-5	Synchro check (using phasor information)	Published	In this application, data are sent from one or more PMU devices to a sync check relay. The relay uses this information to assure the phase angles of the voltage on two sides of a breaker are close enough that the breaker can be closed without harm.	PMU, Relay, Breaker	
61850-90-5	Adaptive relaying	Published	In this application, data is sent from one or more PMU devices to a relay supervision function. The receiving device uses this information to adjust relaying parameters or settings so the relay is making optimal decisions based on the actual system configuration. This type of application as currently envisioned is a low-speed application that takes advantage of the precision and wider observability of the phasor measurement system.	PMU, Relay Supervisor	
61850-90-5	Out-of-step protection	Published	In this application, data is sent from two (or more) PMU devices to a controller that detects out-of-step conditions between substations or system areas. It uses the phase angle and frequency measurements to detect excessive and increasing phase angle, and takes action to reduce the angle or island the system.	PMU, Out-of-step Controller, Power System Control Equipment	

IEC document	Use Case Title	Pub. status	Description	Actors / Roles	IEC 62559-2 compliance
61850-90-5	Situational awareness	Published	In this application, data is sent from one or more PMU devices to alarm and display applications in a control centre. These applications may include processing and alarm functions such as oscillation detection and path loading limits. These applications provide alarms to operations personnel based on information derived from the data and compared with pre-programmed criteria.	PMU, ssPDC, PDC, User Applications	
61850-90-5	State estimation and on-line security assessment	Published	In this application, data is sent from one or more PMU devices to state estimator and security assessment applications in a control centre. The state estimator determines all the voltages and power flows in the grid. Security assessment determines the failure risks by applying various criteria to the state estimate. State estimation will initially use synchrophasor data to supplement traditional SCADA data for added functionality and improved performance since phasor measurements will initially be too sparse to fully support its requirements. Once sufficient measurements are available, state estimation can operate exclusively with phasor data.	PMU, ssPDC, PDC, User Applications	

IEC document	Use Case Title	Pub. status	Description	Actors / Roles	IEC 62559-2 compliance
61850-90-5	Archive data (event & continuous)	Published	Measurements from PMUs should be archived for system analysis. Archived data should include both continuous measurements and snapshots triggered by anomalous events. These data need to be accessible for later retrieval and analysis. Continuous archiving is accomplished by applications that either have sufficient storage space that they will not run out between scheduled changes, or which utilize size limiting features that delete the oldest data within a time limit. Triggered archive functionality is initiated by an event trigger (ET), here treated as a black box, which sends to one or more data archivers (DAs) an event notification which indicates a need to archive the event data. Data archiving may be a function within PDCs and ssPDCs or may be a stand-alone application.	PMU, ssPDC, PDC, ET, DA	

IEC document	Use Case Title	Pub. status	Description	Actors / Roles	IEC 62559-2 compliance
61850-90-5	Wide area control – special protection schemes	Published	In this application, data are sent from one or more PMU devices to a controller located at a substation, control centre, or other appropriate facility. The data may go directly to the controller or may go through ssPDC or PDC data gathering devices. Using programmed algorithms, the controller will take action based on these measurements. Control functions can include switching capacitors, reactors or lines, generator dropping, SVC damping, and any other action that can be implemented. This action can include both traditional special protection schemes (SPS, SIPS, RAS, etc.) and more sophisticated schemes that are based on measured system responses rather than pre-programmed responses. Synchrophasors provide accurate high speed measurements useful for this purpose.	PMU, ssPDC, PDC, Controller, System Control Equipment	

IEC document	Use Case Title	Pub. status	Description	Actors / Roles	IEC 62559-2 compliance
61850-90-5	Predictive dynamic stability maintaining system	Published	When a severe fault occurs in a loop or mesh network connecting two major power systems, an out-of-step condition can occur between the two systems. By checking fora suitable indicator that would denote the occurrence of a disturbance having a gradual onset of between 5 s to 10 s, an out-of-step condition can be detected and by subsequently splitting the system at a specific point it is possible to prevent the out-of-step occurring. The system is composed of PMUs which are used to gather information and are located at each major point of the power system; the IED enables the splitting of the power system. The IED and PMU are connected within a communication network. Each PMU sends the voltage angle for its own part of the power system to the IED. The IED compares the angles between the PMUs and predicts the future angle. If the predicted angles between the PMUs in system A and the PMUs in system B exceed pre-determined values, the IED determines that an out-of-step condition will occur and trips the CB. Alternative method: The IED measures the angular difference between PMUs under normal conditions. When a disturbance occurs, the change in angular difference is calculated from the generator rotor angle (speed) or from frequency deviation.	PMU, IED	

IEC document	Use Case Title	Pub. status	Description	Actors / Roles	IEC 62559-2 compliance
61850-90-5	Under voltage load shedding	Published	Major blackouts such as those that occurred in Tokyo and France in 1987 and those in the North American E astern interconnections and Southern Europe in 2003 were related to voltage instability. Since transmission reinforcements are hard to justify as solutions to voltage instability and cascading outages experienced under extreme conditions, under voltage load shedding would seem to be a suitable alternative contingency. The example system is composed of PMU s installed at four 500 kV substations and IED s installed at several 275 or 154/66 kV substations. The IED s are connected to all PMUs. One of the purposes of the IED is to detect long-term voltage collapse; this is executed at the 500 kV network level as opposed to the 275 kV or lower voltage networks which are automatically regulated by tap changing on the 500/275 kV or 154 kV transformers. The IED affords high reliability by use of the following procedure. The IEDs detect slow types of voltage collapse, in the range of eight seconds to two minutes, by detecting unusual continuous $\Delta V/\Delta t$ values. Fast voltage collapse can also be detected using a $\Delta V/\Delta t$ calculation with a one second data window. Each IED can trip more than one line. When the IED detects a voltage collapse, it trips each line CB following expiration of an on- delay timer which can be set independently for each line. (Independent time settings are applied for each line)	PMU, IED	

IEC document	Use Case Title	Pub. status	Description	Actors / Roles	IEC 62559-2 compliance
61850-90-5	Phenomenon assumption type WAMPAC	Published	When a very severe fault occurs, such as the complete loss of an important power corridor, generators may lose synchronisation with the power network. It may also cause overload of transmission lines or transformers. Imbalance between generation and consumption can occur when a power system network is separated resulting in abnormal frequency conditions. Phenomenon assumption type WAMPAC (Wide Area Monitoring, Protection and Control) executes generator shedding or load shedding in order to avoid these types of unstable conditions on the power system network based on a pre-fault calculation using on -line power system information. Phenomenon assumption type WAMPAC is composed of data collecting Terminal Equipment (PMU_M: PMU class M), collecting and Triggering Terminal Equipment (PMU_P: PMU class P), Controller Terminal Unit (IED) and Central Equipment (CE). PMU_M is located at the main substation and the power station. PMU_P is located at the substation in which the detection of the faults predicted (such as line faults) is possible. IED units are located at power stations in which the generators to be shed are located. PDC and CE are typically located in a central control centre where on -line power system information from PMU_M and PMU_P can be obtained.	PMU, PDC, CE, IED	

Document	Use Case Title	Pub. status	Description	Actors / Roles	IEC 62559-2 compliance
61850-90-5	Phasor Data Concentrator (PDC)	Published	The Phasor Data Concentrator (PDC) function receives or subscribes to phasor data streams from one or more PMUs and/or other PDCs. The primary purpose of the PDC is to assemble one or more new output data streams from these input data streams. By combining phasor data from many sources into one or a few merged streams, the PDC enables transport of data from many individual PMU sources using a limited number of communications paths and/or or paths of limited data capacity. A PDC can also publish a single phasor data stream for subscription by client functions described in Use Cases below, including situational awareness, state estimation, on - line security assessment, display, data processing, alarming, archiving, and wide area control. With this PDC function at the input, these subscribing application functions do not require communications connections or management for a long list of individual PMU sources. The functions within the PDC function that are needed to accomplish this merging are: a) selection of particular values from input streams; b) validation of input values, including data presence, test mode, and quality; c) aggregation of values from input streams to create one or more output streams; d) decimation or interpolation of input value streams to allow aggregation of data	PMU, ssPDC, PDC, User Applications	

Document	Use Case Title	Pub. status	Description	Actors / Roles	IEC 62559-2 compliance
			with different sampling rates; e) time alignment of input values from different streams; f) protocol conversion in either direction between the IEC 61850 -90 -5 protocol as specified in other clauses of this document, and the communications protocol formats of IEEE C37.118 -2005, C37.118.2 -2011, IEEE 1344, or other specified transport protocols; g) security implementation – authentication and/or encryption for input or output streams; h) calculation or scaling of derived values from input values, for insertion in an output stream (e.g. insert phase shift, or compute phase angle between input locations). Functions a) to c) in this list are essential for any PDC. Functions d) and e) are core functions within the PDC function, but may not be needed in every application, and thus may be configured as 'off' in a particular case. Functions f) to h) are functions that need not be present in every PDC application; if included, these functions may also be configured as 'off'. While the PDC function list is typically provided in one physical equipment unit, some of the functions it performs might also be carried out in other units elsewhere in the system configuration – especially functions f) to h). By performing communications protocol conversions per f), the PDC enables the		

Document	Use Case Title	Pub. status	Description	Actors / Roles	IEC 62559-2 compliance
			integration of legacy data sources or user applications with communications systems based on IEC TR 61850 -90 -5 or on other protocols, such as IEEE C37.118- 2005. This conversion function thus supports migration towards exclusive use of IEC TR 61850- 90- 5. The use case diagram below shows how a PDC may publish more than one output stream. Furthermore, each output stream may have unique identification, synchrophasor data points listing, sampling rate, communications protocol, or security features configuration. In the use case diagram and following description, as well as other use cases, show a Substation Phasor Data Concentrator (ssPDC) as a distinct functional entity. ssPDC is described in 6.4.2 , as opposed to a PDC at a higher level of the hierarchy as described in 6.4.3 . However, the ssPDC is just a specific instance of a PDC and may have any of the eight functions listed above included and enabled.		

Document	Use Case Title	Pub. status	Description	Actors / Roles	IEC 62559-2 compliance
61850-90-6	***Use of IEC 61850 for Distribution Automation Systems***	***BPUB***	***on-going Use Case development***		
61850-90-6	1a. Fault identification and report	BPUB	The fault detection process (and possible FLISR) is described considering both only local fault indication and different kinds of extra-substation communication, according to FPIs communication classes describe in IEC 62689-1.Different types of faults (short circuits, earth faults, etc.) are not considered explicitly, the fault is a generic one. Possible automatic reclosing cycles are not considered in this generic Use Case.	Electric Grid, FeProt at main substation, FtPInd, FtInd, FtDet, Field Operation Personnel (FOP), RTU, DMSapp, Quality index system, FtMgtapp, Fault Location	X
61850-90-6	1b. Overcurrent non-directional Fault Localization and Indication	BPUB	This Use case is relevant to the overcurrent non-directional fault Localization and Indication (phase to earth fault on solid earthed systems) with or without confirmation (ref. IEC 62689-1, F1C/NC…). It relies on 1a. and has several specificities.	Electric Grid, FeProt at main substation, FtPInd, FtInd, FtDet, Field Operation Personnel (FOP), RTU, DMSapp, Quality index system, FtMgtapp, Fault Location	
61850-90-6	1c. Phase to earth faults, non-directional fault detection	BPUB	This Use cases relies on the generic 1a., but fault signature detection is assumed to be capable of detecting phase to earth faults, non-directional faults.	Electric Grid, FeProt at main substation, FtPInd, FtInd, FtDet, Field Operation Personnel (FOP), RTU, DMSapp, Quality index system, FtMgtapp, Fault Location	

Document	Use Case Title	Pub. status	Description	Actors / Roles	IEC 62559-2 compliance
61850-90-6	1d. Overcurrent and Phase to earth faults detection non-directional	BPUB	This case is just the concatenation of the two previous ones	Electric Grid, FeProt at main substation, FtPInd, FtInd, FtDet, Field Operation Personnel (FOP), RTU, DMSapp, Quality index system, FtMgtapp, Fault Location	
61850-90-6	1e. Overcurrents, directional and non-directional, fault detection	BPUB	This Use cases relies on the generic 1a., but fault signature detection is assumed to be capable of detecting overcurrents, directional and non-directional, faults. It will request to handle directionality of fault in the information exchange.	Electric Grid, FeProt at main substation, FtPInd, FtInd, FtDet, Field Operation Personnel (FOP), RTU, DMSapp, Quality index system, FtMgtapp, Fault Location	
61850-90-6	1f. Overcurrents, non-directional, phase to earth faults, directional and non-directional fault detection	BPUB	This Use cases relies on the generic 1a., but fault signature detection is assumed to be capable of detecting overcurrents, non-directional, phase to earth faults, directional and non-directional faults. It will request to handle directionality of fault in the information exchange.	Electric Grid, FeProt at main substation, FtPInd, FtInd, FtDet, Field Operation Personnel (FOP), RTU, DMSapp, Quality index system, FtMgtapp, Fault Location	

Document	Use Case Title	Pub. status	Description	Actors / Roles	IEC 62559-2 compliance
61850-90-6	1g. Overcurrents and phase to earth faults, directional and non-directional fault detection	BPUB	This case is just the concatenation of the two previous ones	Electric Grid, FeProt at main substation, FtPInd, FtInd, FtDet, Field Operation Personnel (FOP), RTU, DMSapp, Quality index system, FtMgtapp, Fault Location	
61850-90-6	2a. Fault Location, Isolation and Service Restoration using sectionalizers detecting fault current	BPUB	FLISR logic alters the topological structure of distribution feeder systems by changing the open/close status of switches under abnormal operating conditions. In particular, when a permanent fault occurs and the upstream recloser changes to lockout status after the reclosing sequence is complete, FLISR can selectively change switch statuses to isolate a fault and restore power to as much load as possible. This process can be fully automatic or supervised by the distribution system operator from the Control Centre.	Electric Grid, Field Autorecloser, Field Sectionalizer, Tie Switch Fault Detector, FeProt at main substation, Substation Computer, SysOp, DMSapp, FtMgtapp, FLISRapp	X

Document	Use Case Title	Pub. status	Description	Actors / Roles	IEC 62559-2 compliance
61850-90-6	2b. Fault Location, Isolation, and Service Restoration (FLISR) using sectionalizers detecting feeder voltage (SDFV)	BPUB	This FLISR logic automatically alters the topological structure of distribution feeder systems by changing the open/close status of switches according to feeder voltage detection. In particular, when a permanent fault occurs and the upstream sectionalizer changes to lockout status after the fault section is identified, FLISR can selectively change switch statuses to isolate a fault and restore power to as much load as possible.	Electric Grid, Sectionalizer, Switching equipment as tie Switch, FeCtl, FeProt (equipment) at main substation, FeProt (function) at substation, DMSapp, FtMgtapp, FLISRapp, FtLOCapp, Service Restoration Controller	X
61850-90-6	3a. Fault Location, Isolation and Service Restoration in a radial feeder based on centralized control	BPUB	When a permanent fault occurs on a feeder, the main breaker will trip and reclose one or more times but then remains open. Fault passage indication information is sent to the control centre so that the system and/or operator can decide where the fault is located and send commands to isolate the faulty section. If the fault is successfully isolated, then the final step is to send a command to reclose the feeder breaker and restore power to the upstream healthy section.	Electric Grid, FeProt at main substation, FtPInd, Switching equipment actuator, SysOp, DMSapp, Quality index system, FLISRapp	X

Document	Use Case Title	Pub. status	Description	Actors / Roles	IEC 62559-2 compliance
61850-90-6	3b. FLISR of an open loop feeder based on centralized control	BPUB	When a permanent fault occurs on a feeder, the main breaker will trip and reclose one or more times but then remains open. Fault passage indication information is sent to the control centre so that the system and/or operator can decide where the fault is located and send commands to isolate the faulty section. If the fault is successfully isolated, then the final step is to send commands to close the feeder breaker and the tie switch to restore power to the healthy sections upstream and downstream of the faulty section.	Electric Grid, FeProt at main substation, FtPInd, Switching equipment actuator, Tie switch equipment actuator, SysOp, DMSapp, Quality Index system, FLISRapp	

Document	Use Case Title	Pub. status	Description	Actors / Roles	IEC 62559-2 compliance
61850-90-6	4a. Fault Location, Isolation and Service Restoration in an open loop network based on distributed control	BPUB	In the distributed distribution automation system (DAS) of an open loop feeder, the service restoration controller recognizes the real time topology of the feeder by polling its neighbouring FeCtls, and controls the service restoration of downstream healthy sections of a fault. Having detected a permanent fault, the FeCtls on the concerned feeder will exchange fault detection and control information with each other through a peer-to-peer communication network, recognize and isolate the faulty section, and then restore the service of healthy sections.	Electric Grid, Feeder Protection equipment at main substation (FeProt at main substation), Feeder Protection equipment at feeder end substation (FeProt at end substation), Switching equipment actuator, DMSapp, Tie switch equipment actuator, Feeder equipment controller (FeCtl), adjacent Feeder equipment controller (Adjacent FeCtl), Feeder equipment controller downstream to fault (Downstream FeCtl), Feeder equipment controller upstream to fault (Upstream FeCtl), Service Restoration Controller, FeProt at main substation, Switching equipment actuator, Tie switch equipment actuator, FeCtl	X

Document	Use Case Title	Pub. status	Description	Actors / Roles	IEC 62559-2 compliance
61850-90-6	4b. Fault Localization and Isolation (with related info reporting) in a feeder radially operated, built with distributed protection breaker capabilities	BPUB	The main purpose of this Use Case is, by the usage of breakers along the feeder and telecommunication, not only ensure the automatic isolation of earth faults, but also to prevent as well unwanted islanding conditions. The Transfer Trip without fault has not been considered in this version of the document. If required a new section will be added accordingly. For a better comprehension, the complete Use Case has been spilt into three different sub-cases, according to the fault location: Fault along MV feeder Fault inside End User's plant Fault along MV feeder with presence of DER and consequent need of transfer trip to avoid possible uncontrolled islanding	Feeder In Line Protection, GeneralProt-eu, GeneratorInterfaceDisconnect-eu, Grid, FeProt at main substation, FtPInd, In line FeProt-u, In line FeProt-f, In line FeProt-d, GeneralProt-eu, Fault Operation, Personnel (FOP), RTU, DMSapp, FtMgtapp, FLISRapp	X
61850-90-6	5. Centralized Voltage and Var Control	BPUB	VVC manages the status of switching shunt capacitors, voltage regulating transformers and substation OLTC in order to direct the power system towards an operating condition with minimum power losses and/or as flat of a voltage profile as possible, among other things. The application can be active throughout the day, and can be triggered by the operator or another DMSapp application. It can operate in a fully automated way, or it can be designed to provide recommended settings for capacitors and transformers, only to be confirmed by the operator at the control centre.	Electric Grid, SysOp, Switching equipment actuators, DMSapp, Shunt Capacitor Switch, Transformer Tap, VVC	X

Document	Use Case Title	Pub. status	Description	Actors / Roles	IEC 62559-2 compliance
61850-90-6	6. Anti-islanding protection based on communications	BPUB	The feeder and the connected equipment (loads and DERs) are not designed to work in an islanding mode. In case of the feeder circuit breaker opens, an unintentional islanding may have been created and then has to be detected. The auto-recloser function has to be blocked. The involved DER has to been forced to stop energizing the feeder. An incorrect manual operation that opens the circuit breaker could also cause an unintentional island.	Electric Grid, Voltage presence indicator (VPI), DER Unit Controller, DER Unit, DER Management System, Substation protection device, Distribution, Substation Automation System (SAS) (Substation controller), DMSapp	X
61850-90-6	7. Perform Automatic Source Transfer	BPUB	This System Use Case describes the automatic transfer switch function. When a voltage loss occurs on the primary source, the system decides under specific conditions to transfer the load to the backup source	Field Actuators, Source Transfer, Management System, Voltage Presence, Indicator, Voltage Sensor,	X
61850-90-6	8a. Monitor Energy flows	BPUB	Provides detailed active or reactive or net cumulated energy either per quadrant, or globally delivered or received at the point of measurement, based on the energy flows direction conventions.	Electric Grid, Ms(I,U), Ms(Wh), FieldComp config tool, DMSapp, Ms(power flow direction)	Partial
61850-90-6	8b. Monitor energy flows for operation purpose	BPUB	Provides detailed active or reactive or net cumulated energy either per quadrant, or globally delivered or received at the point of measurement, based on the energy flows direction conventions.	Electric Grid, Ms(I,U), Ms(Wh), FieldComp config tool, DMSapp, Ms(power flow direction)	Partial

Document	Use Case Title	Pub. status	Description	Actors / Roles	IEC 62559-2 compliance
61850-90-6	8c. Elaborate the direction of the energy flow	BPUB	Based on given conventions, elaborate the direction of power flows.	Electric Grid, Ms(I,U), Ms(Wh), FieldComp config tool, DMSapp, Ms(power flow direction)	Partial
61850-90-6	9. Environment situation awareness	BPUB	Manage a set of specific sensors related to environment situations such as weather conditions, flooding conditions, live presence status, geographical perimeter status (doors...) and elaborates from these raw measurement warning and alarms based on pre-defined threshold and other criteria.	External environment, DMSapp, SsCtl	X
61850-90-6	10. Configuration of IEDs participating in distributed control	BPUB	By running this Use Case, each IED located along the feeder and participating in a distributed automation function related to this given feeder, will receive adequate information, including communication interface and topology information, possibly provided to other entities.	FieldComp, New FieldComp, FieldComp to be reconfigured, FieldComp manufacturer, IT Engineer, Planning Engineer, FieldComp Config engineer, FieldSyst Config tool, FieldComp config tool, Configuration file manager, Communication NTW	

Document	Use Case Title	Pub. status	Description	Actors / Roles	IEC 62559-2 compliance
61850-90-11	***Methodologies for modelling of logics for IEC 61850 based applications***	***PWI***	***Ongoing Use Case development***		
61850-90-11	Direct transfer open operation	PWI	Direct transfer open operation (DTOO) from substation A to open the other line end circuit breakers (QA0 and QA2) in substation B when the operator decides to open the central circuit breaker (QA0) or the feeder circuit breaker (QA2) of the line in substation A.	Operator, IED (or IEDs) at substation A implementing the logic scheme	
61850-90-11	Busbar disconnectors coupled in a double busbar arrangement	PWI	When both busbar A disconnector and busbar B disconnector are in a closed or unknown status, the bay is considered to be coupled to both busbars	Busbar Disconnectors	
61850-90-11	Delayed breaker trip and blocking after 1st low SF6 pressure alarm level in GIS substation – Busbar A	PWI	When the SF6 pressure in a busbar A associated compartment in a GIS substation drops to the first of two levels, a low SF6 pressure alarm appears and a 24/48 hours timer starts. When time elapses, a trip signal is sent to all breakers connected to busbar A.	Barometers, Breakers	
61850-90-11	Bay connected to busbar A	PWI	When both the breaker and the busbar A disconnector are closed, the bay is considered to be connected to busbar A.	Busbar A Disconnector, Breaker	
61850-90-11	Bay connected to busbar B	PWI	When both the breaker and the busbar A disconnector are closed, the bay is considered to be connected to busbar B.	Busbar B Disconnector, Breaker	

Document	Use Case Title	Pub. status	Description	Actors / Roles	IEC 62559-2 compliance
61850-90-11	Temporary blocking of CB closings	PWI	The blocking of CB closings in the different bays prevents from closing the CB when a closing command is sent if the Temporary Blocking setting is activated and its adjusted timer has not expired.	CB	
61850-90-11	Definite Trip	PWI	The trip issued to a CB can be considered definitive. No more cycles of tripping and reclosing are expected.	CB General trip, CB, Recloser	
61850-90-11	Line Outage detection in a breaker and a half scheme	PWI	Provide a secure and reliable indication that a Line Outage (at least from one end) exists.	CB Positions, Phase Currents, Maintenance Switch Information, Undercurrent Element	
61850-90-11	Fixed Logic	PWI	The XCBR LN located in a protection and control IED receives via two InRef DOs the information of two physical inputs wired to the IED: CB opened and CB closed. With a fixed logic internal to the LN, the Pos DO can represent in its stVal DA the 4 different states of a DPC Data Type.	CB Position, CB	
61850-90-11	Unit trip logic	PWI	Provide a stable grid condition depending on available lines	CB Positions, Outage and Trip Indications	
61850-90-11	Data quality management	PWI	PTUV operation is usually grouped as only one operation indication information to the control centre. In this Use Case we will suppose a simple case of the PTUV function in a substation with two bays	Under voltage trip information from one or several bays	

Document	Use Case Title	Pub. status	Description	Actors / Roles	IEC 62559-2 compliance
61850-90-11	Busbar change-over	PWI	An outgoing bay is supplied from busbar 1 of a double busbar substation. This bay shall be changed over to busbar 2 without interrupting the supply.	Network operator initiating the change-over.	
61850-90-14	***Using IEC 61850 for FACTS (Flexible AC Transmission Systems) data modelling***	***PWI***	***Ongoing Use Case development***		
61850-90-14	FACTS Controllers and Power Conversion	PWI	Yet to come	Station/Remote Operation, External Blanks, Coordinated FACTS Shunt Controller (Remote)	
	System Status / Generic Sequence Processing	PWI	A FACTS device or power converter application has different defined states of operation, that are based on various status conditions and operation steps of converter and substation related equipment. An operator can usually perform those actions manually, but in order to simplify operation state-of-the-art control systems usually comprise a state machine that can be triggered to perform step-by-step or automatic complete transitions between different states.	Station/Remote Operation	
	Get Converter/FACTS Status		Display of the application's operation mode	Station/Remote Operation, Converter	

Document	Use Case Title	Pub. status	Description	Actors / Roles	IEC 62559-2 compliance
	Control Operation Mode		Change the application's operation mode	Station/Remote Operation, Converter, Sequence State Machine, Protection	
	Get Sequence Status		Display of the application's sequence status	Station/Remote Operation, Sequence State Machine	
	Sequence Processing Timeout		Display a sequence or step timeout	Station/Remote Operation, Sequence State Machine	
	Control Sequence Mode		Change the application's sequence mode	Station/Remote Operation, Sequence State Machine, Protection	
	Emergency Shutdown		Immediately shut down the converter / FACTS device in case of emergency	Station/Remote Operation	
	Configuration	PWI	This Use Case describes the change the change of configuration of a FACTS controller. This is where parameters and settings are configured. Some configuration settings are not available from remote but can only be changed by a local user. Examples of settings are enabling and disabling of a control mode, updating reference values for a control mode etc. Common control modes are listed in, other vendor specific control modes may exist.	Station/Remote Operation	

Document	Use Case Title	Pub. status	Description	Actors / Roles	IEC 62559-2 compliance
	Enable/disable control mode		Use case for enabling or disabling a control mode. Depending of this setting the control mode will be active or not when the shunt connected FACTS device is in the InOperation-state and Automatic Control is enabled.	Station/Remote Operation	
	Change parameter associated with control mode		A set of settings per control mode that is changeable by local or remote user.	Station/Remote Operation	
	Send result of command		The server sends the result of the previous function to the user.	Station/Remote Operation	
	Coordinated Controlled FACTS Operation	PWI	This example sub-Use Case describes the actions performed to change the operation mode of a FACTS controller	Station/Remote Operation, Coordinated FACTS Shunt Controller (Remote)	
	Start Command		Available in the state ReadyToStart. Triggers a transition to the StartSequnce-state.	Station Operator, Remote Operator	
	Stop Command		Available in the state InOperation. Triggers a transition to the StopSequnce-state.	Station Operator, Remote Operator	
	Cancel Start Command		During the StartSequence, the actor remote/station operator issues a cancel start command.	Station Operator, Remote Operator	
	Send Result of the Command		Sends Operation Results to USER	Station Operator, Remote Operator	

Document	Use Case Title	Pub. status	Description	Actors / Roles	IEC 62559-2 compliance
	Change Control Location		User configures the FACTS Controller to be in. Changing the Control location from local to remote is only available for the local operator.	Station Operator, Remote Operator	
	Liquid Based Cooling Systems	PWI	The converter valve cooling system is an essential an auxiliary system of the FACTS and HVDC device, present in many configurations of HVDC, SVC, STATCOM and TCSC. Malfunction of the cooling system can degrade the transmission or compensation possibilities of a FACTS or power conversion device and eventually cause a trip of the device.	Station/Remote Operation	
	Cooling System Indications		Status indications from cooling system	Valve Cooling System, Control System	
	Cooling System Alarm		Alarm Indication from cooling system	Valve Cooling System, Control System, Station Operator	
	Cooling System Start		Start-order of cooling system	Valve Cooling System, Control System, Station Operator	
	Cooling System Stop		Stop-order of cooling system	Valve Cooling System, Control System, Station Operator	

Document	Use Case Title	Pub. status	Description	Actors / Roles	IEC 62559-2 compliance
	Cooling Pump Control		Control of shifting between pumps	Valve Cooling System, Control System, Station Operator	
	Cooling Emergency Procedure		Indications from cooling system requires protection actions from the control system	Valve Cooling System, Control System	
	Control System Redundancy	PWI	Communication redundancy with-in FACTS or Power Conversion control systems is a common requirement. Functional application redundancy is or will be covered by IEC TR 61850-90-20.	None	
	Control Location / Authority	PWI	The FACTS device or power converter application, as any substation equipment, can be operated from different control locations and levels. The levels are usually identified as Local Mode (Loc), where the operation is done in front of the equipment, Local at Station Level (LocSta), where the operation is done from a local HMI in a substation control room and finally remote from a control centre. For safety reasons substation equipment can be locked, by key or logic, to only allow local operation. Indication of control location is important process data for the operators, regardless whether they work locally or remotely	None	
	Disturbance Records	PWI	As described in 61850-7-500		

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	Degraded Operation	PWI	Some FACTS controllers can be configured in such way that operation can be supported with reduced capacity. The reduction can be caused by faulty conditions, for instance that dynamic range of the controllable reactance is reduced due to thyristor failure. This can be marked using a sub-state called degraded mode. The fault as such is registered by the faulty component and is tracked by the control algorithm as such.	Station/Remote Operation	
61850-90-14	Control of External reactive Components	PWI	The Mechanical Switched Capacitor (MSC) and the Mechanical Switched Reactor (MSR) incorporates only passive components such as capacitors and reactors and can be connected directly to the high voltage busbar system or via a coupling transformer. The control of the device can be in cooperation with a FACTS device. This coordinated control extends the dynamic range of the FACTS device. The coordination requires specific parameters, and the coordination can be turned off or on by operator.	Station/Remote Operation, Reactive Power Control*	
	Enable Q-optimization	PWI	The reactive power control is configured to use external reactive components to optimize the dynamic range of the shunt connected FACTS device	Station/Remote Operation, Reactive Power Control*	
	Increase reactive power	PWI	The control is asked to increase the reactive power by the reactive power control mode of the FACTS controller	Station/Remote Operation, Reactive Power Control*	

Document	Use Case Title	Pub. status	Description	Actors / Roles	IEC 62559-2 compliance
	Decrease reactive power	PWI	The control is asked to decrease the reactive power by the reactive power control mode of the FACTS controller	Station/Remote Operation, Reactive Power Control*	
	Reactive power provided	PWI	The momentary amount of reactive power provided by the external reactive power control.	Station/Remote Operation, Reactive Power Control*	
	Total available reactive power	PWI	The total amount of reactive power available to the external reactive component control	Station/Remote Operation, Reactive Power Control*	
	Reactive Power Control Blocked	PWI	The external reactive power control is blocked due to discharging.	Station/Remote Operation, Reactive Power Control*	
* Whether the Reactive Power Control should be considered as an actor or not is not decided yet.					
61850-90-14	Coordinated FACTS Device Operation	PWI	-	Station Operator, FACTS Control System, Coordinated FACTS Controller (remote)	
	Request to Optimize	PWI	Optimization request command to other SVC	Station Operator, FACTS Control System, Coordinated FACTS Controller (remote)	

Document	Use Case Title	Pub. status	Description	Actors / Roles	IEC 62559-2 compliance
	Optimization Allowed	PWI	Optimization allowed feedback to other SVC	Station Operator, FACTS Control System, Coordinated FACTS Controller (remote)	
	Optimization Completed	PWI	Optimization completed command to other SVC	Station Operator, FACTS Control System, Coordinated FACTS Controller (remote)	
	Optimization Prohibited	PWI	Optimization prohibited feedback to other SVC	Station Operator, FACTS Control System, Coordinated FACTS Controller (remote)	
	System ready for optimization	PWI	Status of the other system(s). Other system needs to be "on" and in automatic voltage control mode.	Station Operator, FACTS Control System, Coordinated FACTS Controller (remote)	
	LifeBit	PWI	Life bit command to other SVC	Station Operator, FACTS Control System, Coordinated FACTS Controller (remote)	

Document	Use Case Title	Pub. status	Description	Actors / Roles	IEC 62559-2 compliance
61850-90-14	Shunt Connected FACTS device	PWI	Use cases describe typical functions envisaged for substation control centre whom operate a SVC or STATCOM FACTS device using techniques described in this document. These Use Cases include operational and engineering activities.	Station/Remote Operation, External Blanks, Coordinated FACTS Shunt Controller (Remote)	
	Change of operation mode	PWI	This sub-Use Case describes the actions performed to change the operation mode of a FACTS controller.	Station/Remote Operation	
	Change control mode	PWI	This sub-Use Case describes the actions performed to change the control mode.	Station/Remote Operation	
	Configuration and Update Settings	PWI	This Use Case describes the change the change of configuration of a FACTS controller. This is where parameters and settings are configured. Some configuration settings are not available from remote but can only be changed by a local user. Examples of settings are enabling and disabling of a control mode, updating reference values for a control mode etc.	Station/Remote Operation	
	Coordinated FACTS device operation	PWI		Station/Remote Operation, Coordinated FACTS Shunt Controller (Remote)	
	Reset Gain	PWI	USER sends command to reset the gain to the pre-set value.	USER, Coordinated FACTS Shunt Controller (Remote)	

Document	Use Case Title	Pub. status	Description	Actors / Roles	IEC 62559-2 compliance
	Valve Cooling	PWI		User, SVC Control System, Valve Control System	
	Degraded operation	PWI	Some FACTS controllers can be configured in such way that operation can be supported with reduced capacity. The reduction can be caused by faulty conditions, for instance that dynamic range of the controllable reactance is reduced due to thyristor failure. This can be marked using a sub-state called degraded mode. The fault as such is registered by the faulty component and is tracked by the control algorithm as such.	Station/Remote Operation	
	Series Compensations	PWI	Overview of the Use Cases of series compensation	Station/Remote Operation	
	Fixed Series Compensation	PWI	Fixed series compensation reduces the inductance of the power line with capacitors, grouped in one or more segments.	Station/Remote Operation	
	Capacitor Discharge Function	PWI	The purpose of the capacitor discharge function is to discharge the series capacitor via the bypass circuit when the transmission line circuit breakers are opened.	Station/Remote Operation	
	Bypassing of Series Capacitor	PWI	Bypassing of the series capacitor due to protective operation and manual action.	Station/Remote Operation	

Document	Use Case Title	Pub. status	Description	Actors / Roles	IEC 62559-2 compliance
	Lock-out and Temporary Look-out	PWI	Permanent lockout caused by corresponding protective operation. A lockout needs to be acknowledged and bank needs to be manually inserted.	Station/Remote Operation	
	Interlocking	PWI	Disconnect switches and bypass switch commands are executed as long as the interlocking conditions are fulfilled.		
	Auto Reinsertion	PWI	When the protection of a series capacitor bank operates it closes a bypass-breaker, and by that bypasses the capacitor bank. When conventional relay or line protection trips it opens a line-breaker. The implication of that is that the syntax for describing the automatic reinsertion is the opposite of Auto-reclose. For example LN RREC defines reclose time, reclose cycles etc.	Station/Remote Operation	
	Fast Protective Device	PWI	Capacitor banks need to be insulated from the ground and shall also withstand all line current. A practical and economic solution for that is to bypass the capacitor if harmful currents are detected. This can be done by a fast protective device and they are triggered by the control system or self-triggered by for instance the current level.	Station/Remote Operation	
	Zink Oxide Varistor	PWI	Zink Oxide Varistor	Station/Remote Operation, Station/Remote Engineer	

Document	Use Case Title	Pub. status	Description	Actors / Roles	IEC 62559-2 compliance
	SC Protection function Interface	PWI	SC Protection function Interface	Station Operator	
	Varistor Failure Protection	PWI	Varistor Failure Protection	Station/Remote Engineer	
	Varistor Overload Protection	PWI	Varistor Overload Protection	Station/Remote Operation	
	MSSR	PWI	MSSR	Station/Remote Operation	
	Additional Use Cases for TCSC	PWI	The Use Cases for TCSC extends the Fixed Series compensation Use Cases. Only additions are shown here.	Station/Remote Operation	
61850-90-14	Power Converter	PWI			
	Active/Reactive power operation mode selection	PWI	Power converters are capable of, depending on the technology, controlling active and / or reactive power exchange with the connected AC grid with different operation modes or characteristics.	Station/Remote Operation	

Document	Use Case Title	Pub. status	Description	Actors / Roles	IEC 62559-2 compliance
	Active Power Control	PWI	The available control principles for active power control are listed in chapter 0. Each of those modes can be appropriately parameterized either by dedicated specific setpoints or by generic operational characteristic curves. If both setpoints and characteristics are present within the same implementation for the same mode, the application has to take care internally that both types are mutually synchronized.	Station/Remote Operation	
	Reactive Power Control	PWI	The available control principles for reactive power control are listed in chapter 0. Each of those modes can be appropriately parameterized either by dedicated specific setpoints or by generic operational characteristic curves. If both setpoints and characteristics are present within the same implementation for the same mode, the application has to take care internally that both types are mutually synchronized.	Station/Remote Operation	
	Converter Status	PWI	Converter rated values and active limitations are used to represent the power conversion capabilities and process.	Station/Remote Operation, Converter	
	Intermediate DC Circuit	PWI	The DC connection of each single power converter can be connected to or isolated from the DC circuit, and also be earthed. The DC circuit of VSC converters needs to be charged prior to operation and is discharged after operation, therefore this status is also monitored.	Station/Remote Operation, Converter, Local DC Yard Switchgear, Remote DC Yard Switchgear	

Document	Use Case Title	Pub. status	Description	Actors / Roles	IEC 62559-2 compliance
	Power Direction Change	PWI	A major property of HVDC converters is that active power flow can be controlled depending on operator input, not just in magnitude but also in direction. The latter can either be done by implicitly using the sign of a power setpoint for definition of the direction of the power flow and resulting rectifier or inverter operation, or by switching the power direction separately to the magnitude setpoint.	Station/Remote Operation, Converter	
	Run-up/Run-back modules	PWI	Run-Up/Run-Back modules are a very common type of implemented stability functions. They decrease, increase or limit the power flow of an HVDC system automatically in a predefined manner, usually by a set ramping rate, after being activated by a control system internal or external trigger event (e.g. a tripping generator or line). Usually several modules are implemented at every converter station, that can be activated if allowed by the process or configured, independently from each other, and are coordinated in an implementation specific manner.	Station/Remote Operation, External Trigger Condition, Internal Trigger Condition	

Document	Use Case Title	Pub. status	Description	Actors / Roles	IEC 62559-2 compliance
	Automatic Emergency Power Control	PWI	This control function is activated when the detected frequency or voltage of a connected AC grid exceeds pre-set minimum or maximum values and time periods. The HVDC supplies or absorbs pre-set to or from one of the grids to compensate the frequency or voltage deviation. This control is expected to act when the frequency or voltage considerably fluctuates, e.g. as a result of the demand-supply unbalance over the entire grid due to an abnormality, such as a severe grid fault	Station/Remote Operation	
	DC Line fault recovery sequence	PWI	On AC transmission lines an autoreclosing protection function handles flashovers or lightning strikes by tripping the line, thus clearing the fault and reinserting it afterwards. With the DCLFRS a similar protection scheme exists for short circuits to earth on HVDC transmission line systems.	Station/Remote Operation, Protection, Converter	
	DC-Yard Configuration	PWI	Long distance HVDC transmission systems are very often built in a bipolar configuration, consisting of two identical poles with a distinct HV path and a common LV path. However, this DC yard assignment is not fixed, the HV and LV paths can often be flexibly configured to be used in various configurations by both poles.	Station/Remote Operation, Local DC Yard Switchgear, Remote Yard Switchgear	

Document	Use Case Title	Pub. status	Description	Actors / Roles	IEC 62559-2 compliance
	Coordinated mode switchover	PWI	Stability functions, like Run-Up/Run-Back modules or frequency control, are very often station and thus AC network dependent, but by modulating active power flow, may influence the transmission of the whole HVDC transmission system and all connected stations and networks once active.	Station/Remote Operation	
	Function-mode switchgear	PWI	There is a versatile number of independent specialized HVDC control functions implemented in today's control systems. However, their interface towards the operator can very often be reduced down to enabling / disabling the function, the process resulting capability of being able to do so and an indication whether the function is currently actively influencing operation. Furthermore an automatic / manual switchover, alarm indications and alarm or operational acknowledgement and a manual activation trigger may be required. Furthermore, a possible change of one or several control modes and a corresponding indication may be required. Thus, instead of modelling those functions separately they can be represented as instances of a generic control function.	Station/Remote Operation	

Document	Use Case Title	Pub. status	Description	Actors / Roles	IEC 62559-2 compliance
	Harmonic filter control and supervision	PWI	When reactive power exchange of an HVDC station is performed by controlling mechanically switched equipment the related status of this equipment, usually AC harmonic filters, measurements and corresponding control modes need to be handled	Station/Remote Operation, AC Filter Circuit, DC Filter Circuit, Protection	
	Tap changer control and supervision	PWI	HVDC converters are connected to the AC side by means of power transformers that adapt the primary side AC voltage to a secondary side AC voltage suitable for the converter. As both AC voltage fluctuations and voltage drop across the transformers need to be compensated they are equipped with tap changers.	Station/Remote Operation, On Load Tap Changer	
	Control by external reference	PWI	Power output of SFC converters is sometimes controlled by an external reference signal that is proprietarily and continuously provided to the SFC control system. This input path can be enabled on demand, any disturbance is monitored.	Station/Remote Operation, External Reference	
61850-90-16	***System management for IEC 61850***	***ACD***			
61850-90-16	Enable Automation System to perform operational functions in best conditions	ACD	There is a necessity for the Smart Grid Devices for adaptability, as a huge number of equipment will have to be able to be patched, updated and reconfigured and to adapt to the evolving and growing cybersecurity threats.	Distribution Grid Operator, Equipment Manufacturer, Grid Operator, IED systems management operator	X

Document	Use Case Title	Pub. status	Description	Actors / Roles	IEC 62559-2 compliance
61850-90-16	Update automation-system devices configuration file and firmware	ACD	This System Use Case starts with the operator selecting on the Device Management Information System (DMIS) the IED whose configuration and/or firmware he wants to update. He has the choice between two scenarios: he can either remotely update the device with a configuration file only, or he can chose to have the device firmware updated and maybe its configuration too (if needed or decided by the operator). In case of failure for a configuration update the device can fall back on its previous configuration, hosted at IED level. The operator can abort those updates during the process.	IED systems management operator, Device Management Information System (DMIS), Intelligent Electronic Device (IED)	X

Document	Use Case Title	Pub. status	Description	Actors / Roles	IEC 62559-2 compliance
61850-90-16	Replace an IED of an automation-system with an identical one	ACD	The new IED should have the same capabilities, it should be an identical IED HW and it should be set-up to ensure the same behaviour than the faulty one with respect to its capabilities. Retrieval mechanisms should ensure availability of the maximum level of information from the IED before it needs to be replaced (Use the complete log + incremental log through the DMIS or available to the DMIS to define the actual IED environment: configuration, FW, persistent data, settings …)	Cybersecurity-Elements Management Information System (CEMIS), Asset-Patrimonial Information System (APIS), Asset-Operations Information System (AOIS), Asset-Health Information System (AHIS), Asset-Location Information System (ALIS), Asset-Configuration and data Information System (ACIS), IED systems management operator, Asset Field Operator, System Operator, SCADA system, Device Management Information System (DMIS), Intelligent Electronic Device (IED)	X

Document	Use Case Title	Pub. status	Description	Actors / Roles	IEC 62559-2 compliance
61850-90-17	***Using IEC 61850 to transmit power quality data***	***Published***			
61850-90-17	Application of power quality data		Modelling of power quality instruments includes all methods to transfer power quality information from IED (e.g. PQI) to an application in the substation, control centre or maintenance centre.	IED, User	
61850-90-17	Request for power quality measurements			IED	
61850-90-17	Sending of power quality events/limit violations			IED	
61850-90-17	Retrieve power quality records			IED	
61850-90-18	***Alarm Handling***				
61850-90-18	Simple System		A single monitoring station connected to a system of IED's without acknowledgement and without latched alarm. The conditions for alarms can be defined either in the IED's or in the monitoring station.		
61850-90-18	Single Level System		A single monitoring station connected to a system of IED's with acknowledgement and without latching alarms. The conditions for alarms can be defined either in the IED's or in the monitoring station. Several users are monitoring on shifts.		

Document	Use Case Title	Pub. status	Description	Actors / Roles	IEC 62559-2 compliance
61850-90-18	Special system with multi user acknowledgement		A single monitoring station connected to a system of IED's with acknowledgement and without latched alarms. The conditions for alarms can be defined either in the IED's or in the monitoring station. Several users are monitoring on shifts. A few alarm instances require acknowledge from more than one user before the system is allowed to return to normal operation. E.g. TSO operator1 and DSO operator2 have a common switchgear component in a system, but with different alarm tasks associated. This Use Case has been evaluated and the proposed solution is to define two separate alarms; one for each user.		
61850-90-18	Wind power system		Several monitoring stations connected either to an alarm concentrator handling alarms from a system of identical distributed IED's or directly to one specific IED. Some of the alarms are defined as latched and all alarms are defined either with or without acknowledgement. The IED's may either be proprietary devices or comply to IEC 61850.		
61850-90-18	Interlinked Alarms		A low alarm is superseded by the low-low alarm. Acknowledging the low-low shall automatically acknowledge the low alarm.		

Document	Use Case Title	Pub. status	Description	Actors / Roles	IEC 62559-2 compliance
61850-90-20	***Guideline to redundancy systems***	***PWI***			
61850-90-20	Redundant clients	PWI	In the redundant clients Use Case, two IEC 61850 client entities (contained in same or different IED) connect to the same server entity and have the same data reported. Thus, both clients receive the same data during normal operation. An internal redundancy management does the coordination between the clients. In the case that both clients are communicating actively with the server (modular redundancy), a voter takes the decision which information is forwarded to/received from the consuming application. The used voting algorithm is an implementation issue and depends on the application.	Application, IED	
61850-90-20	Service on demand	PWI	In the Service on demand Use Case, a human user or a technical entity wants to perform a service request. Executing the service requests involves other, possibly redundant, subsystems. The control function of a circuit breaker from a control centre is used as an example. The substation SCADA system is redundant and the bay controller IED is redundant. The underlying redundancy mechanisms shall ensure that the control request is executed even when a single failure occurs.	Operator, Control Centre, Substation SCADA, IED, Circuit Breaker	

Document	Use Case Title	Pub. status	Description	Actors / Roles	IEC 62559-2 compliance
61850-90-20	Calculation of logic plans	PWI	In the calculation of logic plans Use Case, typically a technical system triggers the execution of a logic plan calculation. Executing the logic plan calculation Use Case involves other, possibly redundant, subsystems. Logic plan calculation is typically done by a programmable logic controller (PLC).	Inputs from process, Outputs to process	
61850-90-20	Regulation	PWI	A regulation function permanently or periodically delivers outputs to the process based on inputs from the process and reference values set from some client. In this case both RS IEDs should 'know' the same reference values.	Inputs from process, Outputs to regulated process, Reference values	
61850-90-20	Maintenance	PWI	*Yet to come*		

Document	Use Case Title	Pub. status	Description	Actors / Roles	IEC 62559-2 compliance
61850-90-20	Redundant publisher – one subscriber	PWI	In the redundant publisher Use Case, two redundant IEDs are publishing the semantically identical information in a Goose message. A subscriber IED subscribes to both GOOSE message, to get the updated information even when one publishing IED or the communication network fails. A redundant telecontrol proxy/gateway can be used as an example of a redundant IED. Both IEDs publish the EEHealth information of their ITCI logical node. The subscribing IED (e.g. a bay controller) uses the EEHealth value to switch the Loc status between local and remote. Thus, the bay controller will automatically go to local operation when the connection to the control centre is lost. Switching to local control in the bay controller shall be done if either none of the GOOSE messages is received, or both GOOSE messages signal the EEHealth as "Alarm". As typically only the active publisher IED serves the control centre connection the status of EEHealth can be different between both publisher IEDs.	Main publisher, Backup publisher, Subscriber	
61850-90-20	Redundant breakers IED	PWI	To increase the availability of the digital substation, redundant Breaker IEDs are installed.	*Yet to come*	
61850-90-20	Redundant merging units	PWI	To increase the availability of the digital substation, redundant Merging Units are installed.	*Yet to come*	

Document	Use Case Title	Pub. status	Description	Actors / Roles	IEC 62559-2 compliance
61850-90-20	Resiliency and Redundancy Use Case concerning RGOOSE	PWI	The actual Use Case is that the IED subscribes to a single GOOSE that is published by the redundant controller pair.	*Yet to come*	
61850-90-20	Clusters / virtual redundant devices	PWI	*Yet to come*		
61850-90-20	Redundant physical systems with correlating active/active and active/hotstandby functions inside	PWI	*Yet to come*		
61850-90-20	Transfer of PMU data over wide area network	PWI	*Yet to come*		
61850-90-20	substation to substation communication between redundant system	PWI	*Yet to come*		
61850-90-20	Use case Circuit breaker failure and interlocking	PWI	*Yet to come*		
61850-90-20	Use case Setting Service	PWI	*Yet to come*		

Document	Use Case Title	Pub. status	Description	Actors / Roles	IEC 62559-2 compliance
61850-90-21	***Travelling Wave Fault Location***				
61850-90-21	Single-ended fault location		Single-ended travelling wave fault location is achieved by a device at one end of the line only. The device records the travelling wave signals generated by the fault. Through automatic or manual analysis of the record, the location of the fault can be established.	Electric Grid, Protection, Circuit Breaker, Travelling Wave Fault detector – local end, Master Station, Electric System Operator, Field Operation Personnel	X
61850-90-21	Double-ended fault location through peer-to-peer communications		Double-ended travelling wave fault location is achieved by one device at each end of the line. The devices record the travelling wave signals generated by the fault. Through automatic or manual analysis of the records from both ends, the location of the fault can be established.	*Yet to come*	X
61850-90-21	Double-ended analysis through communications with the master station		Double-ended travelling wave fault location with a master station is achieved by one device at each end of the line and a master station for fault distance calculation. The devices records the travelling wave signals generated by the fault and sends this to the master. Through automatic or manual analysis of the records from the two ends, the location of the fault can be established.	Electric Grid, Protection, Circuit Breaker, Travelling Wave Fault detector – local end, Travelling Wave Fault detector – remote end, Master Station, Electric System Operator, Field Operation Personnel	X

Document	Use Case Title	Pub. status	Description	Actors / Roles	IEC 62559-2 compliance
61850-90-21	Wide area fault location		Wide-area traveling wave fault location makes use of traveling wave data from various substations across the monitored transmission network to achieve reliable fault location even in the case that a detection device installed at a substation fails and/or that such a device is not installed. This method uses information exchange between devices located at the nodes of the network with a central station which determines the location of the fault using the information received.	Electric grid, LiProt, Circuit Breaker, Time synchronization system, WAFL_Surge collecting terminal unit, WAFL_Central computer, Network topology and configuration data base, SCADA master Electric system operator, Field Operation Personnel	X
61850-90-21	Pulse radar echo method		The device for active pulse radar echo method transmits signal and records transmission and echo at the one end of the transmission lines, and then evaluates the propagation time to the fault point by recorded signals. Fault distance is calculated by multiplying propagation time and velocity and dividing the result by two. This device is triggered by external system or manual operation. It is applicable for uncharged lines by periodical or manual signal transmission. This method includes both pulse and wave type radars.	Protective relay, Transmission line, Circuit Breaker, Active radar FL device, Corporate web server, Maintenance Centre HMI, Dedicated fault detector	X

Document	Use Case Title	Pub. status	Description	Actors / Roles	IEC 62559-2 compliance
61850-90-21	Integration with other fault location and disturbance recording functions in a substation		Study the integration of the travelling wave fault location with protection, other types of fault location (e.g., impedance-based fault location) and disturbance recording functions, so as to provide more comprehensive information about the location, the fault type and the cause of fault.	Electric Grid, Protection, Circuit Breaker, Travelling Wave Fault detector – local end, Fault location using impedance, Master Station, Disturbance recorder	X
61850-90-21	Testing and calibration		Provide Use Case scenarios for testing and calibration of travelling wave fault location system.	Electric Grid, Protection, Circuit Breaker, Travelling Wave Fault detector – local end, Electric System Operator	X
* Whether the Reactive Power Control should be considered as an actor or not is not decided yet.					

5.5 TC 57 WG 10 list of roles used

IEC document	Actor/Role	Description
BUSINESS ROLES		
61850-4	Project Requirement Engineer	He sets up the scope of the project, its boundaries, interfaces, functions and special requirements ranging from needed environmental conditions, reliability and availability requirements up to process related naming and eventual specific address range restrictions or product usage. He defines what he wants to have application wise and how he wants to operate the system (project requirement specification). He finally accepts the delivered system.
61850-4	Project Design Engineer	He defines, based on the requirements specification, how the system shall look like; its architecture, requirements on the products needed to fulfil the required functions, how the products should work together. He thus defines the system design specification.
61850-4	Manufacturer	He supplies the products from which the system is built. If necessary, he supplies a project specific IED configuration.
61850-4	System Integrator	He builds the system, engineers the interoperation between its components based on the system design specification and the concretely available products from the manufacturers, and integrates the products into a running system. This results in a system configuration description.
61850-4	IED Parameterizing Engineer	He uses the set-up possibilities of the system and device configuration to adjust the process, functional and system parameters of an IED to the project-specific characteristics
61850-4	Testing and Commissioning Engineer	He tests the system on the basis of the system configuration description, system design and requirements specification and additional documentation, and puts the system into operation.
61850-4	Vendor	IED Provider.
61850-6	IED Configurator	The IED Configurator is a manufacturer-specific, may be even IED specific, tool that shall be able to import or export the files defined by this part of IEC 61850. The tool then provides IED-specific settings and generates IED-specific configuration files, or it loads the IED configuration into the IED.
61850-7-5	Network Operator	

IEC document	Actor/Role	Description
61850-90-3	Maintenance Worker	Inspects and repairs the GIS
61850-90-3	Energy Operator	Measures the remaining energy in the operating mechanism. Typical operating mechanisms today use spring, hydraulics, or gas based energy storage.
61850-90-3	Remote operators	Act as the remote operators, who want to be informed on the auxiliary power system status and on events in case of external or internal failures
61850-90-11	Network operator initiating the change-over	
61850-90-16	Distribution Grid Operator	Entity responsible for the planning, operation, maintenance, and the development in given areas of the electricity distribution network (LV, MV, and potentially HV), the quality of electricity supply (power delivery, voltage etc.) and for customer access to ESR market through his system under regulated conditions. Equivalent to MV/LV System Operators. [See IEC 62913-2-1]
61850-90-16	Equipment Manufacturer	Entity that produces and sells electrical devices and electricity management devices.
61850-90-16	Grid Operator	A party that operates one or more grids. It can be a EHV and HV System Operator and/or a HV and MV/LV System Operator. [See IEC 62913-2-1]
61850-90-16	Grid User	A party connected to the grid and consuming and/or producing electricity. Grid Users include Consumers, Producers, and Prosumers. Prosumer is a party that both consumes and produces electricity. The term comes from the contraction of producer and consumer; a prosumer is therefore a consumer who has generation and/or storage capabilities in its premises (see Part 1 Prosumer definition). Equivalent to Party Connected to the Grid. [See IEC 62913-2-1]
61850-90-16	Asset Field Operator or Asset Maintenance Operator	A party responsible for maintaining physical assets from commissioning to decommissioning during their service life
61850-90-16	System Operator	Party responsible for safe and reliable operation of a part of the electric power system in a certain area and for connection to other parts of the electric power system. [SOURCE: IEC 60050-617:2009, 617-02-09]

IEC document	Actor/Role	Description
61850-90-16	IED's system management operator	A party responsible for configuring, administrating, supervising and maintaining IEDs from commissioning to decommissioning during its service life
61850-90-6	Electric System operator (SysOp)	Person who monitors network and identifies the need for and performs or contributes to perform required switching using the FLISRApp Application
61850-90-21	Electric system operator	
61850-90-6	Field Operation Personnel (FOP)	Person who is activated by people/systems in charge of monitoring network. He performs the required switching operation in filed using the outcome of an overall FLISRapp.
61850-90-21	Field Operation Personnel	
SYSTEM ROLES		
61850-6	System Configurator	The System Configurator is an IED independent system level tool that shall be able to import or export configuration files defined by this part of IEC 61850. It shall be able to import configuration files from several IEDs, as needed for system level engineering, and used by the configuration engineer to add system information shared by different IEDs. Then the system configurator shall generate a substation-related configuration file as defined by this part of IEC 61850, which is fed back to the IED Configurator for system-related IED configuration. The System Configurator should also be able to read a System specification file for example as a base for starting system engineering, or to compare it with an engineered system for the same substation.
61850-90-1	Measuring equipment	Measures current (and voltage) from protected line
61850-90-1	Comm. I/F –S	Receives data from the local relay and sends the data to the remote end
61850-90-1	Comm. I/F –R	Receives data from the remote end and gives the data to the local relay
61850-90-1	Comm. I/F –S-RT	Receives sampled data from the remote terminal and sends the data to the central equipment
61850-90-1	Comm. I/F –R-RT	Receives trip command from Comm. I/F –S-CE (the central equipment) and passes the command to the remote terminal

IEC document	Actor/Role	Description
61850-90-1	Comm. I/F –R-CE	Receives sampled data from Comm. I/F –S-RT (the remote terminal) and passes the data to the central equipment
61850-90-1	Comm. I/F –S-CE	Receives a trip command from the central equipment and sends the command to the remote terminal
61850-90-1	Commander	Requests local equipment to send a trip command to the remote equipment
61850-90-1	Switch state acquisition	Switch states from line, at least earth switch and line disconnector
61850-90-1	Interlocking controller	Uses remote switch states for local interlocking logic
61850-90-1	Protection relay	Gives the tripping information to the auto-reclosing scheme
61850-90-1	Central Controller	
61850-90-2	Maintenance centre	A place from where maintenance, management of asset, disturbance analysis and the metering are managed.
61850-90-2	Storage device	IED, disturbance data concentrator or Proxy/Gateway which is able to store one or more disturbance records.
61850-90-2	Meter	Measures, records physical quantities vacations for a fixed duration.
61850-90-3	Gas Sensor	Measures the pressure and temperature inside a gas compartment of the GIS. Density calculation is performed by the sensor itself or by the IED's.
61850-90-3	PD sensor	Measures the phi-q-N for partial discharge inside a gas compartment of the GIS
61850-90-3	UHF Sensor	Measure the PD activity using the UHF signal treatment. As the UHF sensor is fitted on a compartment, the UHF signal localization is not directly associated to this compartment.
61850-90-3	Other Sensors	Depending on the technology additional sensors can be used. Measures the moisture / SO2, etc.
61850-90-3	Maintenance Planner	Schedules maintenance work

IEC document	Actor/Role	Description
61850-90-3	Asset Management	Process that involves various things in the company both in the form of asset or human resources who work there; a collective investment whose objective is to provide maximum results at minimum investment or low cost. Specific definition (Clauses 5 GIS and 6 Power Transformer): System used for asset management (Expert system, historian, maintenance planner, etc.) Specific definition (Clauses 7 LTC and 8 UGC): Manage specifications and histories of target equipment Specific definition (Clause 9 TL): Monitor status of the transmission tower. In case of the prefined setting value being violated, the operation centre (RCC/NCC) receives an alarm message with statistical data from the tower condition server Specific definition (Subclause 9.3.4 Surrounding Area Supervisor): Read the image data for on-line supervisor. The operation centre (RCC/NCC) receives an alarm message with image data from the surrounding area server.
61850-90-3	Primary Current Sensor	Measures the primary current flow through main contacts of the circuit breaker
61850-90-3	Travel Sensor	Measures the movement of the main contact of the circuit breaker
61850-90-3	Switch	Signalize the switch position to the monitoring system
61850-90-3	Hydraulic Level Sensor	Measures the hydraulic level inside the operating mechanism. Hydraulics can be used either to transfer energy from energy storage to the main contact or to realize the energy storage itself.
61850-90-3	Hydraulic Temperature Sensor	Measures the temperature of the hydraulic
61850-90-3	Motor Current Sensor	Measures the current of a) the charging motor for the energy storage or b) the drive motor
61850-90-3	Humidity Sensor	Measures the humidity
61850-90-3	Hydraulic Pressure Sensor	Measures the pressure of the hydraulic
61850-90-3	Hydraulic Pump Sensor	Monitor the normal/abnormal status of the hydraulic pump
61850-90-3	Switch position	Indicates the position of the connected switch
61850-90-3	Operator	A special monitoring (or maintenance) HMI

IEC document	Actor/Role	Description
61850-90-3	ERP System	Assess the investment of the substation
61850-90-3	Coil Voltage	Measures the voltage of the CB coil
61850-90-3	Drive Temperature	Measures the temperature of the drive
61850-90-3	Configuration management	System used to configure parameters of IED and manage configurations
61850-90-3	Dissolved gas and moisture sensor	Measure dissolved gas concentration (ranges from one to multiple gases)
61850-90-3	Relative Humidity Sensor	Measure relative humidity in oil
61850-90-3	Oil Temperature Sensor	Measure temperature of the oil at the location of the humidity sensor
61850-90-3	Operation	System used for asset operation (SCADA, DMS, SAS, etc.)
61850-90-3	Partial Discharge Sensor	Measure partial discharge in the transformer
61850-90-3	Direct Winding Temperature Sensor	Measure winding temperature directly
61850-90-3	Load Current Sensor	Measure the transformer load current
61850-90-3	Top Oil Temperature Sensor	Measure the transformer oil temperature at the top of the tank
61850-90-3	Bottom Oil Temperature Sensor	Measure the transformer oil temperature at the bottom of the tank
61850-90-3	Winding Hot Spot Temperature	Measured or calculated, it is the temperature of the hottest point of the transformer winding (see Temperature supervision Use Case)
61850-90-3	Current Sensor	Measure bushing leakage current
61850-90-3	Voltage Sensor	Measure bushing voltage from capacitive coupler

IEC document	Actor/Role	Description
61850-90-3	Ambient Temperature Sensor	Measure ambient temperature
61850-90-3	Cooling Bank Status Sensor	Digital sensor that detects if a cooling bank is in operation
61850-90-3	Pump/fan Current Sensor	Measure the pump/fan current
61850-90-3	Measure Motor-Driving Current	Measure the motor driving current.
61850-90-3	Torque Sensor	Measure the drive torque.
61850-90-3	Tap Position Sensor	Indicate tap position of LTC.
61850-90-3	LTC Operation Signal Sensor	Detect start/end time of LTC operation.
61850-90-3	Equipment Supervision	Detect start/end time of LTC operation.
61850-90-3	Maintenance Planning Support	Support planning maintenance work.
61850-90-3	LTC Oil Temperature Sensor	Measure temperature of LTC oil.
61850-90-3	Transformer Oil Temperature Sensor	Measure temperature of transformer oil.
61850-90-3	LTC Oil Flow Relay	Detect LTC oil flow relay operation caused by gas produced by arc discharge.
61850-90-3	OFU (Oil Filter Unit) Operation Signal Sensor	Detect start/end time of OFU operation.
61850-90-3	Temperature Sensor	Measure temperature on cable surface. It could measure temperature at one point, or multiple points.
61850-90-3	Position Sensor	Measure how long a cable is displaced from a reference point.

IEC document	Actor/Role	Description
61850-90-3	Oil Pressure Sensor	Measure pressure of oil injected into a cable.
61850-90-3	Oil Level Sensor	Measure oil level in a tank.
61850-90-3	Line Sensor	Measure line current, current direction, temperature and slope and send them to the line condition server.
61850-90-3	Meteorological Sensor	Measure wind velocity/direction, humidity, ambient temperature, snowfall and insulation.
61850-90-3	Tension Sensor	Provide tension from load cell between transmission line and tower.
61850-90-3	Inclination Sensor	Provide slope data of Inclination sensor.
61850-90-3	GPS Sensor	Provide location information, i.e., altitude, latitude, longitude and UTC Time
61850-90-3	Main power input	Act as the main power input to feed loads with auxiliary power
61850-90-3	Backup power input	Act as the backup power input to feed loads with auxiliary power
61850-90-3	Power source switches	Switches which will be operated by the "Monitor and control" system of the auxiliary power system to select the healthy source
61850-90-3	Power storage	Act as the system where power will be stored (act as a load) and extracted (act as a generator) to feed loads with auxiliary power in case of absence of main and backup power.
61850-90-3	Power auxiliary loads	Act as the system of loads and associated power distribution mean, fed by the Auxiliary power system. These loads may be "smart" and react automatically depending on the information delivered by the auxiliary power system
61850-90-5	PMU	Computes synchrophasors & frequency
61850-90-5	Relay	Checks phase angle between selected inputs
61850-90-5	Relay Supervisor	Receives data & makes setting adjustments based on pre-determined algorithm and tables using syncrophasor measurements
61850-90-5	Out-of-step Controller	Receive data from the local PDC & perform various processing, alarming, and visualization functions

IEC document	Actor/Role	Description
61850-90-5	Power System Control Equipment	Controls the power system through switching, FACTS power controllers, DC controls, etc.
61850-90-5	ssPDC	Substation Phasor Data Concentrator – collects, aligns, selects & possibly decimates data from several PMUs in the substation
61850-90-5	PDC	Phasor Data Concentrator – collects, aligns, selects & possibly decimates data from several PMUs or other PDCs
61850-90-5	User Applications	Receive data from the local PDC & perform various processing, alarming, and visualization functions
61850-90-5	ET	Event trigger – notifies PDCs and ssPDCs to archive data within a particular time frame for later retrieval / analysis
61850-90-5	DA	Data archiver – a functional unit with the ability to store continuous or event data from a PDC or ssPDC in non-volatile media for later retrieval and analysis
61850-90-5	Controller	Receive data from the local PDC & execute algorithms that implement control functions
61850-90-5	System Control Equipment	Power system control elements including breakers, switches, FACTS power controllers, DC controls, and similar equipment
61850-90-5	CE	Central Equipment. CE estimates the power system state, and selects the target power system primary equipment to be controlled in order to maintain stability for a specific fault, the result of the calculation is transmitted to the IED.
61850-90-6	Autorecloser (AR)	Function which is located in the field along the feeder to protect the downstream assets by eliminating fault current and having communicating capability to indicate trip conditions to upper levels. This device includes the protection detection function and the recloser function. It also has the ability to be remotely controlled to re-energise the protected feeder.
61850-90-6	Controller at distribution substation	Controller function installed at the substation level which communicates with both the field devices and the control centre. FLISRapp may be implemented at the substation computer as an option.
61850-90-6	DER Management System (DER MS)	The DER MS provides the DER-type-independent communication interface for the communication to the DMS. It forwards the information coming from the DER unit and executes the commands from the DMS.

IEC document	Actor/Role	Description
61850-90-6	DER Unit	Distributed energy resources. A DER Unit consists of the physical equipment to generate, store and consume electrical power.
61850-90-6	DER Unit Controller (DERCTL)	Distributed energy resources. A DER Unit consists of the physical equipment to generate, store and consume electrical power.
61850-90-6	DMS application module (DMSapp)	Refer to IRM.It represents the aggregation of Network Operation, Fault Management, and many others DMS System feature hosted at control centre level that monitors continuously the Grid network and based on a given network topology reflects the energy path and flows.
61850-90-6	Electric Grid	Represent the set of equipment of a distribution feeder including lines, DER, loads, interconnections, switching equipment and voltage transformers.
61850-90-6	Electric Network Fault management	Refer to IRM
61850-90-6	Electric Network Planning (Planning)	Refer to IRM
61850-90-6	Electric Network quality index system (QIS)	System which collects outage data for reporting to Utility Commissions
61850-90-6	Electrical measurement(Ms(I,U))	Function that elaborates electrical measurement such as I, U, P, Q, PF etc.
61850-90-6	Energy counting for operation (Ms(Wh))	Function that elaborates energy counting (for operational purpose)
61850-90-6	Power Flow direction computation(Ms(power flow direction))	Function that elaborates the direction of power flow: forward – from supply or backward – to supply (for operational purpose)
61850-90-6	Fault Indicator(FtInd)	Function that identifies the presence of a fault on the Grid.

IEC document	Actor/Role	Description
61850-90-6	Fault location application module (FtLOCapp)	Fault location module of a FLISRapp
61850-90-6	Fault passage indicator at feeder level (FtPInd)	Function located along the feeder and capable of detecting and indicating a fault. It includes the needed sensors to perform the function.
61850-90-6	Fault signature detection (FtDet)	Function that detects and reports on fault presence (including the update of concerned statistics)
61850-90-6	Electric Network Fault management application module (FtMgtapp)	Application module which manages or help managing network faults impact and resolution (usually part of an Outage Management application module)
61850-90-6	Feeder equipment controller (FeCtl)	Feeder equipment controller located along a feeder which helps to control either the feeder switching equipment and possibly a set of equipment connected to the feeder at this connection point (such as a MV/LV transformer, and a LV switchgear)
61850-90-6	Substation controller (SsCtl)	Substation controller which helps to control any equipment located in a selected substation (such as a HV/MV transformer, HV incomers, MV feeders)
61850-90-6	External environment	Groups many external elements such as weather conditions, flooding conditions, live presence status, geographical perimeter status (doors, etc.)
61850-90-6	Adjacent feeder equipment controller (Adjacent FeCtl)	Feeder equipment controller located adjacent to another specific feeder equipment controller, i.e., its attached switching equipment are sharing a same line segment.
61850-90-6	Feeder equipment controller downstream to fault (Downstream FeCtl)	Feeder equipment controller located along a feeder and specifically located downstream to a fault.

IEC document	Actor/Role	Description
61850-90-6	Feeder equipment controller upstream to fault (Upstream FeCtl)	Feeder equipment controller located along a feeder and specifically located upstream to a fault.
61850-90-6	Feeder Protection equipment at feeder end substation (FeProt at end substation)	A Feeder Protection equipment located at the other end of the feeder.
61850-90-6	Feeder In Line Protection equipment (FeProt in line)	A Feeder Protection equipment located within the feeder
61850-90-6	Feeder Protection equipment at main substation (FeProt at main substation)	A breaker-type equipment associated with a protection function, located at the main substation to protect an outgoing feeder. It may have communication capability to indicate trip conditions to upper levels. It may also have the ability to be remotely controlled (closed) to re-energise the feeder. It may as well have an autoreclosing function.
61850-90-6	Feeder Protection function at substation (FeProt at substation)	A function located in the substation that trips a breaker to eliminate fault current in a feeder. It may also reclose the breaker when a preconfigured delay time is expired after the breaker is tripped.
61850-90-6	General Protection function at end-user side (GeneralProt-eu)	A function located at the connecting point of the End User in charge of clearing faults inside its premise.
61850-90-6	Generator Interface protection function (GeneratorInterfaceProt-eu)	A function(s) which are located inside the End User power plant in charge of tripping to disconnect the generators in case of faults in the Distribution Network..

IEC document	Actor/Role	Description
61850-90-6	Generator Interface disconnection function (GeneratorInterfaceDisconnect-eu)	A function(s) which are located inside the End User power plant in charge of disconnecting the generators when the GeneratorInterfaceProt -eu trips etc.
61850-90-6	Field level physical component (FieldComp)	IEC 61850 physical component of a selected system
61850-90-6	Field level physical component configuration engineer (FieldComp config engineer)	Person who is in charge of using a Field level physical component configurator
61850-90-6	Field level physical component configurator (FieldComp config tool)	Configurator of an IEC 61850 physical component of a selected system
61850-90-6	Field level physical component setting tool (FieldComp setting tool)	Tool used to enter field parameter settings for an IEC 61850 physical component of a selected system
61850-90-6	Field level physical feeder sub-system configurator (FieldSyst config tool)	Configurator of a subsystem made of IEC 61850 physical components including potentially many substation/equipment of a selected feeder or a set of feeders
61850-90-6	FLISR application module (FLISRapp)	Application module that performs Fault Location, Isolation and Service Restoration at network operation level
61850-90-6	New Field level physical component	New IEC 61850 physical component of a selected system

IEC document	Actor/Role	Description
61850-90-6	ProcessComp	Any physical component (asset, such as switch, breaker, transformer, lines etc.) located at "process zone level". It enables hosting the common properties such physical asset has, such as a physical nameplate, a volume, a location, an age…
61850-90-6	Power Transformer Tap	Taps actuator on transformer windings that change the turns ratio of the transformer
61850-90-6	Remote terminal at Substation (Substation RTU)	Gateway function with the capability of receiving or sending data/control from or to an external source (for example, electronic multifunction meters, digital relays, controllers), ensuring the interface of a substation of field equipment to the remote world. This device may be either a function included in other devices and/or a specific device including also the so-called Remote Terminal Units.
61850-90-6	Sectionalizer	Function located along the feeder – sectionalizers/sectionalizing autoreclosers, and switches.
61850-90-6	Service Restoration Controller (SRC)	The function that controls the service restoration of downstream healthy sections of a fault. This function internally gets the support of the role "Operation Planning – switching action scheduling" to establish the switching sequence – this may have been predefined at configuration
61850-90-6	Shunt Capacitor Switching equipment	Switches associated with shunt capacitors. They can operate automatically through remote communications from the control centre, or manually by the field crew.
61850-90-6	Switching equipment actuator	Primary equipment switches which are located along the grid lines to enable the operator or the system to isolate the faulty section. They can be manually operated or remotely/locally operated through the FSCs. In this Use Case we will restrict our analysis to remotely controllable switches.
61850-90-6	Switching equipment as Tie switch	A special normally open tie point device function, which is able to sense voltage presence on both sides of its current interrupting mechanism. It also includes the logic to close the interrupting mechanism either automatically upon loss of voltage on one side, or through communication control command. This function can be implemented with recloser, sectionalizer or switch.
61850-90-6	Tie switch equipment actuator	Actuator of a switching equipment operated as a Tie switch

IEC document	Actor/Role	Description
61850-90-6	Voltage presence indicator (VPI)	A device that indicates the presence of voltage over a certain limit on the measured point. It includes the needed sensors to perform the function
61850-90-6	VVC application module (VVCapp)	Application that performs voltage and var control. It determines optimal settings for capacitors and voltage regulators, and either applies them directly to the devices or recommends them to the DSO for approval.
61850-90-11	Operators	
61850-90-11	Busbar Disconnector	
61850-90-11	Barometer	
61850-90-11	CB General Trip	
61850-90-11	Recloser	
61850-90-11	CB Position	
61850-90-11	Phase Currents	
61850-90-11	Maintenance Switch Information	
61850-90-11	Undercurrent Element	
61850-90-11	CB Positions, Outage and Trip Indications	
61850-90-11	Under voltage trip information from one or several bays	
61850-90-14	Station/Remote Operation	Local or remote SCADA, HMI, EMS or NCC system that displays or acquires values and issues operator or automatic commands using IEC 61850 in a client role
61850-90-14	External Blanks	One or more MSC or MSR capable of exchanging control commands and status information using IEC 61850

IEC document	Actor/Role	Description
61850-90-14	Coordinated FACTS Shunt Controller (Remote)	One or more FACTS controller capable of exchanging control commands and status information using IEC 61850
61850-90-14	Converter / FACTS	Power converter or FACTS device
61850-90-14	Sequence State Machine	Application control sequence
61850-90-14	Protection	Protection functions with the capability to trip or block equipment
61850-90-14	Valve Cooling System	
61850-90-14	Control System	
61850-90-14	FACTS Control System (IEC 61850 Server)	
61850-90-14	Converter	HVDC converter
61850-90-14	Internal Trigger Condition	
61850-90-14	External Trigger Condition	
61850-90-14	Local DC Yard Switchgear	
61850-90-14	Remote DC Yard Switchgear	
61850-90-14	AC Filter Circuit	Harmonic filter circuit, consisting of several components (e.g. resistors, capacitors, inductors) connected to an AC system
61850-90-14	DC Filter Circuit	Harmonic filter circuit, consisting of several components (e.g. resistors, capacitors, inductors) connected to a DC system
61850-90-14	On Load Tap Changer	Transformer OLTC of one or multiple phases

IEC document	Actor/Role	Description
61850-90-14	External Reference	Third-party system that provides a simultaneous automatic reference value for P-Control
61850-90-16	SCADA System	Supervisory Control And Data Acquisition system
61850-90-16	Asset-Location Information System (ALIS)	The Information System recording field location information (latitude, longitude, link to physical infrastructures ...)
61850-90-16	Asset-Patrimonial Information System (APIS)	The Information System recording patrimonial information such as (Supplier, plate number, procurement information etc.)
61850-90-16	Asset-Health Information System (AHIS)	The Information System recording health information of an asset (counters, status, watchdogs, alarms ...)
61850-90-16	Asset-Operations Information System (AOIS)	The Information System recording field and remote construction, commissioning, decommissioning, maintenance and inspection operations
61850-90-16	Device Management Information System (DMIS)	Any Information System managing one or multiple IED, with the capability to transmit data, control, files from, or to, an IED, for example configuration, supervision or maintenance purpose.
61850-90-16	Grid history information system (GHIS)	The Information System archiving electrotechnical measures, and monitoring information from the grid
61850-90-16	Cybersecurity-Elements Management Information System (CEMIS)	Information System with a validation and management role over the cybersecurity elements (keys, certificates, RBAC etc.) for a given system with the capability to transmit data from, or to, equipment or systems.
61850-90-16	Asset-Configuration and data Information System (ACIS)	The Information System recording configuration and settings data changes in automation-systems
61850-90-20	HMI	HMI which is a place from where an operator can perform control actions and monitor data coming from substation.
61850-90-20	Substation SCADA	Substation SCADA is a place where a master station is located. The substation SCADA receives and processes data coming form IEDs

IEC document	Actor/Role	Description
61850-90-21	Electric Grid	
61850-90-21	Protection	
61850-90-21	Travelling wave fault detector – local end	
61850-90-21	Master Station	
61850-90-21	LiProt	Line protection device
61850-90-21	Time synchronization system	Time source or time distribution system
61850-90-21	WAFL_Surge collecting terminal unit	Surge collecting terminal unit
61850-90-21	WAFL_Central computer	Fault location calculating computer
61850-90-21	Network topology and configuration data base	Power system and WAFL_Surge collecting terminal unit configuration data base
61850-90-21	SCADA master	
61850-90-21	Protective relay	
61850-90-21	Transmission line	
61850-90-21	Active radar FL device	
61850-90-21	Corporate web server	
61850-90-21	Maintenance Centre HMI	
61850-90-21	Dedicated fault detector	
61850-90-21	Fault location using impedance	

IEC document	Actor/Role	Description
61850-90-21	Disturbance recorder	
61850-90-11	Breaker	
61850-90-5	Breaker	Connects/disconnects power line
61850-90-1	CB	Disconnects the protected line from other system (circuit breaker)
61850-90-11	Circuit Breaker (CB)	
61850-90-20	Circuit Breaker	A mechanical switching device, capable of making, carrying and breaking currents under normal circuit conditions and also making, carrying for a specified duration and breaking currents under specified abnormal circuit conditions such as those of short circuit
61850-90-21	Circuit Breaker	
61850-4	IED	Intelligent Electronic Device. Any device incorporating one or more processors, with the capability to receive or send, data/control from, or to, an external source, for example electronic multi-function meters, digital relays, controllers. Device capable of executing the behavior of one or more specified logical nodes in a particular context and delimited by its interfaces.
61850-90-2	IED	A device that acquires and computes process data.
61850-90-5	IED	Receives data from PMUs, predicts dynamic stability & power system control
61850-90-16	Intelligent Electronic Device (IED)	Any device incorporating one or more processors, with the capability to receive or send, data/control from, or to, an external source, for example electronic multi-function meters, digital relays, controllers. Device capable of executing the behaviour of one or more specified logical nodes in a particular context and delimited by its interfaces.
61850-90-20	IED	A device that acquires and computes process data.
61850-90-2	Control Centre	Receives and processes data
61850-90-20	Control Centre	Control centre which is a place where a master station is located. The control centre (SCADA, EMS, DMS, GMS, grid operators) receives and processes data coming from substation.
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IEC document	Actor/Role	Description
61850-90-2	User	Could be: • Control centre which is a place where a master station is located. The control centre (SCADA, EMS, DMS, GMS, grid operators) receives and processes data coming from substation. • Maintenance centre which is a place from where maintenance, management of asset, disturbance analysis and the metering are managed. • A local user which is a technician having to intervene on the substation automation system.

6 Use cases and roles of TC 57 WG 13, *Energy Management Systems Application Program Interfaces (EMS API)*

6.1 General

The scope of WG 13, *Energy Management Systems Application Program Interfaces (EMS API)*, is to produce standard interface specifications for "plug-in" applications for an electric utility power control centre Energy Management System (EMS) or other system performing the same or similar functions; and to facilitate the integration of applications developed by different suppliers in the control centre environment and exchange of information to systems external to the control centre.

6.2 Documents used

IEC reference	Name	Publication status	Edition
61970-452	CIM static transmission network model profiles	Published	3
61970-453	Diagram layout profile	Published	2
61970-454	Business Object Registry Service Specification	CD	1
61970-456	Solved power system state profiles	Published	2
61970-502-8	Web Services Profile for 61970-4 Generic Services	PWI	1
61970-552	CIM XML Model exchange format	Published	2
61970-555	CIM based efficient model exchange format (CIM/E)	Published	1
61970-600-1	Common Grid Model Exchange Specification (CGMES) – Structure and rules	Published	1
61970-600-2	Common Grid Model Exchange Specification (CGMES) – Exchange profiles specification	Published	1
61968-13	Common distribution power system model profiles	ACDV	2

6.3 TC 57 WG 13 Use Case reporting

WG number of identified Use Cases	% of Use Cases described with IEC 62559-2	% of Business Use Cases	% of System Use Cases	Number of roles identified			% of non-defined roles
20	0 %	75 %	25 %	21	9,52 %	90,48 %	80,95 %

6.4 TC 57 WG 13 List of Use Case per normative document

IEC document	Use Case Title	Pub. status	Description	Actors / Roles	IEC 62559 compliance
61970-452: CIM Static transmission network model profiles	Model Exchange between Regional Security Coordinators Acting as Peers	Published	Coordinators (or "Modeling Authority") of adjacent regions maintain the official, detailed model of their own territory, and regularly make all updates available to its neighbors.	Security Coordinators (EMS + CIM Modeler)	
61970-452: CIM Static transmission network model profiles	Hierarchical Modeling	Published	Assembly and distribution of models from lower level transmission owning entities by upper level organizations with responsibility for markets and/or reliability and/or regional planning.	EMS, CIM Modelers	
61970-453: Diagram Layout Profile	Graphics Exchange	Published	Instead of maintaining duplicate schematics for different applications, the schematics are exported by one system and imported by the other system.	Control Centre System, GIS System, Planning System, Substation Automation System	
61970-454: Business Object Registry Service Specification	Naming Service	CD	Resource naming that can support merging of overlapping models, cross-referencing of resources names from different data models, and assures consistency of data models as changes are made.	Applications	

IEC document	Use Case Title	Pub. status	Description	Actors / Roles	IEC 62559 compliance
61970-456: Solved power system state profiles	EMS State Estimation to Bus-Branch Analysis	Published	Efficient standard method of producing state estimator results and making them available to other applications	Data Modeler, SCADA, Network Model Builder, Schedule Updater, State Estimator	
61970-456: Solved power system state profiles	ENTSO-E Process: Day-Ahead Congestion Forecast	Published	Support for the daily analytical operational process of Day Ahead Congestion Forecast (DACF) at the ENTSO-E Regional Group Continental Europe		
61970-456: Solved power system state profiles	System Planning Studies Process	Published	Cooperative construction of future models by interconnection members in order to support planning of the interconnection		
61970-456: Solved power system state profiles	Harmonization of Planning and Operations Models	Published	Ensure consistency of network model despite the significant differences in how they are handled in operations and planning contexts.		
61970-502-8: Web Services Profile for 61970-4 Generic Services	Common User Interface Data Services	PWI	The Web Services described allow exchange of utility data from a variety of sources	Data Consumer, Data Provider	

IEC document	Use Case Title	Pub. status	Description	Actors / Roles	IEC 62559 compliance
61970-552: CIM/XML Model Exchange Format	Example of Incremental Model Update	Published	This Use Case is to illustrate the difference document approach to handling incremental model updates	Regional Energy Co., Network Power Co.	
61970-555: CIM based efficient model exchange format (CIM/E)	Real Time Sharing on CIM Model	Published	Consider an interconnection power grid with two Control Centres, A and B. Each control centre has an EMS from different vendors. Although A has no direct responsibility for parts of the grid supervised by B, B still have an influence on A's grid. A is, therefore, obliged to maintain a model of these additional parts in at least enough detail to gauge their effect on its own part of the grid.	Control Centres	
61970-555: CIM based efficient model exchange format (CIM/E)	Online Dynamic Stability Analysis	Published	CIM/E solution has been used for an on-line Dynamic Stable Analysis (DSA) project in China. The DSA is activated by real-time event or runs every 15 minutes. It is also applied on smart grid dispatching platform pilot projects, which is a new generation platform for EMS, DSA, WAMS and MMS. These projects have been put into operation at many control centres and the main objective of sharing real-time models for the whole power system among multiple control centres has been achieved.	SCADA, SE, SA/DSA, SCUC/SCED, AGC/AVG	

IEC document	Use Case Title	Pub. status	Description	Actors / Roles	IEC 62559 compliance
61970-600-1: Common Grid Model Exchange Specification (CGMES) – Structure and rules		Published	See below		
61970-600-2: Common Grid Model Exchange Specification (CGMES) – Exchange profiles specification		Published	See below		

The Use Cases supporting CGMES are defined in external documents such as System Operation Guidelines, Common Grid Model Methodology, Coordinating Security Analysis Methodology, KORRR (Key Organizational Requirements, Roles and Responsibilities), which supports Article 40 of the System Operation Guidelines and whose approach is to define in particular:

- Who exchanges information?
- How is the information exchanged?
- When is the information exchanged?
- How is the information stored?

RDFS Profiles

DiagramLayoutProfileRDFSAugmented-v2_4_15-16Feb2016

DynamicsProfileRDFSAugmented_noAbstract-v2_4_15-16Feb2016

DynamicsProfileRDFSAugmented-v2_4_15-16Feb2016

EquipmentBoundaryProfileRDFSAugmented-v2_4_15-16Feb2016

EquipmentProfileCoreOperationRDFSAugmented-v2_4_15-4Jul2016

EquipmentProfileCoreRDFSAugmented-v2_4_15-4Jul2016

EquipmentProfileCoreShortCircuitOperationRDFSAugmented-v2_4_15-4Jul2016

EquipmentProfileCoreShortCircuitRDFSAugmented-v2_4_15-4Jul2016

GeographicalLocationProfileRDFSAugmented-v2_4_15-16Feb2016

StateVariablesProfileRDFSAugmented-v2_4_15-16Feb2016

SteadyStateHypothesisProfileRDFSAugmented-v2_4_15-16Feb2016

TopologyBoundaryProfileRDFSAugmented-v2_4_15-16Feb2016

TopologyProfileRDFSAugmented-v2_4_15-16Feb2016

Exceptionally, IEC 61968-13 is not handled by WG 14 but by WG 13. For actor description, see 7.4, *TC 57 WG 14 list of roles used*.

IEC document	Use Case title	Pub. status	Description	Actors	Profiles	IEC 62559-2 compliance
61968-13	*Common distribution power system model profiles*	*ACDV*				
61968-13	Part 13 – Provision of DSO network model and state to TSO	ACDV	The System Use Case describes how the TSO is provided with an aggregate view of DSO power system model including the current and forecasted active and reactive power related to loads and different kind of distributed generation.	NO-NMON	SteadyStateHypothesis, Functional, ElectricalProperties	X
				AM-EINV (Substation and Network Inventory)		
				OP		
				DSO		
61968-13	Part 13 – Optimize Network Operations in Operational Planning	ACDV	No description yet	DSO		
				TSO		
61968-13	Part 13 – DSO provides its power system models to TSO	ACDV	In order to calculate the TSO grid power flow, the DSO provides to TSO an aggregate view of its power system model, including the	DSO		

IEC document	Use Case title	Pub. status	Description	Actors	Profiles	IEC 62559-2 compliance
			related states and measurements.	TSO		
61968-13	Part 13 – A customer provides its DER plant power system models to DSO	ACDV	A DER connection to Distribution grid request is supported by the description of an aggregate view of the DER plant power system model	DSO		
				DER		
61968-13	Part 13 – DSO1 and DSO2 mutual exchange their power system models	ACDV	DSO1 and DSO2 mutual exchange their power system models in order to manage the grid in case of outages on a boundary feeder	DSO		
				DSO		
61968-13	Part 13 – TSO and DSO provides their power system models to a third party	ACDV	TSO and DSO provides their power system models to a third party in order to perform an ex-post analysis of a power quality issue (i.e. Voltage Dips)	DSO		
				TSO		
				Authority		

IEC document	Use Case title	Pub. status	Description	Actors	Profiles	IEC 62559-2 compliance
61968-13	Part 13 – DSO/DNO internal information exchange	ACDV	A DSO/DNO exchanges various information or data between different systems within the company	DSO		
				DNO		
61968-13	Part 13 – DNOs provide their power system models to DSO	ACDV	In order to perform network planning, various analyses, outage management, etc., of the whole distribution grid, the DSO needs power system models of the subordinate DNOs grids.	DSO		
				DNO		

6.5 TC 57 WG 13 list of roles used

Document	Actor name	Actor description
BUSINESS ROLES		
IEC 61970-452	Security Coordinator	(or Modeling Authority). Each of these coordinators has an EMS from a different vendor (therefore with different internal conventions for representing the system). Each is obliged to maintain a model of the other coordinators in at least enough detail to gauge their effect on his own part of the network.
IEC 61970-452	CIM Modeler	CIM modelers have tools for dealing with Modeling Authority sets, renaming, reduction, as well as for editing the model.
SYSTEM ROLES		
IEC 61970-452	EMS	Energy Management System. Computer system comprising a software platform providing basic support services and a set of applications providing the functionality needed for the effective operation of electrical generation and transmission facilities so as to assure adequate security of energy supply at minimum cost.
IEC 61970-453, IEC 61970-555	Control Centre System	
IEC 61970-453	GIS System	Geographic Information System is a system designed to capture, store, manipulate, analyze, manage, and present all types of geographical data. In the simplest terms, GIS is the merging of cartography, statistical analysis, and database technology.
IEC 61970-453	Planning System	
IEC 61970-453	Substation Automation System	
IEC 61970-456	Data Modeler	
IEC 61970-454	Application	
IEC 61970-456	SCADA	
IEC 61970-456	Network Model Builder	
IEC 61970-456	Schedule Updater	
IEC 61970-456	State Estimator	

Document	Actor name	Actor description
IEC 61970-555	SE	
IEC 61970-555	SA/DSA	
IEC 61970-555	SCUC, SCED	
IEC 61970-555	AGC/AVG	
IEC 61970-502-8	Data Provider	
IEC 61970-502-8	Data Consumer	
IEC 61970-552	Regional Energy Co.	
IEC 61970-552	Network Power Co.	

7 Use cases and roles of TC 57 WG 14, *System interfaces for distribution management*

7.1 General

The scope of WG 14, *System interfaces for distribution management*, is to identify and establish requirements for standard interfaces of a Distribution Management System (DMS) based on an interface architecture. The IEC 61968 series is intended to facilitate inter-application integration of the various distributed software application systems supporting the management of utility electrical distribution networks within a utility's enterprise systems environment.

WG 14 organizes its work around the IEC 61968 Interface Reference Model (IRM).

The management of Use cases is also done in Entreprise Architect, therefore we indicate sometimes the reference of the use case when it is found in WG 14 UML Use Case repository by using: (Id UCR-WG 14 *PartNo:xx.yy*) where PartNo is 61968 related Part (3,4,5,6,7,8,9), and xx.yy a Use case number.

7.2 Documents used

IEC reference	Name	Publication status	Edition
61968-3	Interface for network operations	Published	2
61968-4	Interfaces for records and asset management	FDIS	2
61968-5	Distributed Energy Optimization	PRVC	1
61968-6	Interfaces for Maintenance and Construction	Published	1
61968-8	Interfaces for Customer Operations	Published	1
61968-9	Interfaces for meter reading and control	ACDV	3

7.3 TC 57 WG 14 Use Case reporting

WG number of identified Use Cases	% of Use Cases described with 62559-2	% of Business Use Cases	% of System Use Cases	Number of roles identified			% of non-defined roles
72	12,5 %	1,39 %	98,61 %	63	25,40 %	74,60 %	20,7 %

Number of SUC explicitly referencing a BUC: 2
Number of unknown profiles: 14

7.4 TC 57 WG 14 List of Use Cases per normative document

IEC document	Use Case title	Pub. status	Description	Actors	XSD Profiles	IEC 62559-2 compliance
61968	***Application integration at electric utilities – System interfaces for distribution management***					
61968-3	*Interface for network operations*	*Published*				
61968-3	A.2.2 – FLISR for SCADA-Detected Outage, SCADA Switching	Published	FLISR stands for Fault Location, Isolation, and Supply Restoration. When an outage is detected by SCADA or predicted by outage analysis, typically the best information is association of outage with a protective device that has tripped. Fault location refers to the additional observations, signals, and analysis necessary to identify the true cause of the outage, typically a line fault downstream of the protective device. Isolation is the process of switching and cutting that allows the fault location to be safely isolated for repairs. The process of restoring power to healthy islands of network around the isolated area is referred to as supply restoration.	NO-NMON	Incidents, MeasurementAndControls, OperationalTags, OutagesAndFaults, SwitchingPlans, TroubleTicket	
				NO-CTL		
				OP-SSC		
				NO-FLT		
				CS-TCM		
61968-3	A.2.3 – FLISR for Trouble Call & AMI Outage, Crew Switching	Published	This FLISR workflow assumes a manually monitored and controlled network, with field crews investigating and addressing	MR	Incidents, MeasurementAndControls,	

IEC document	Use Case title	Pub. status	Description	Actors	XSD Profiles	IEC 62559-2 compliance
			outages at the direction of a dispatcher who is aided by the Fault Management function of a DMS.	CS-TCM	OperationalTags, OutagesAndFaults, SwitchingPlans, TroubleTicket, EndDeviceEvent, SwitchingOrder, MeterReadings, TroubleOrders,, Jumper*, Cut*	
				NO-NMON		
				NO-FLT		
				MC		
				OP-SSC		
61968-3	A.3.1 – Planned Outage for Maintenance – Manual Process	Published	The current process includes very little interoperability between systems, but instead manual interactions. Also this sequence assumes that all switches are not telemetered and require manual operation.	MC-SCHD	WorkRequest, SwitchingSchedule, Permit	
				Work Manager		
				DMS Operator		
				Field Crew		
61968-3	A.3.2 -Planned Outage for Maintenance – Crew Switching	Published	It is derived from the manual version of this workflow described previously. This sequence assumes that some switches SCADA-controlled and some require manual operation.	MC-SCHD	OutageSchedule, SwitchingPlans, MeasurementsAndControl, OutagesAndFaults, OperationalTags,	
				MC-FRD		
				OP-SSC		

IEC document	Use Case title	Pub. status	Description	Actors	XSD Profiles	IEC 62559-2 compliance
				NO-NMON	WorkOrder*, ClearanceDocument	
				NO-CTL		
				NO-FLT		
				CS-TCM		
61968-4	*Interfaces for records and asset management*	*PRVC*				
61968-4	**BUC – Decide Renewal priorities on network and optimize maintenance programs**		The Generic Business Use Case describes how the Distribution Grid Operator decides asset renewal priorities and optimizes maintenance programs in the planning phase, based on the network asset analysis and the development of failure predictive and condition-based maintenance models.			
61968-4	*SUC – Analytical evaluation of asset health and risk*	PRVC	This Use Case describes analytical evaluation of the health and risk of grid assets by aggregating and processing data available about the assets. The analytical evaluation is used to strategically plan what assets need to be renewed or replaced, and when. The analytical evaluation is also used to determine the maintenance schedule of assets on the basis of their condition.	AM-AMM (Asset Monitoring and Measure-ment)	AssetList, AssetDetails, AssetCatalogue, TypeAssetCatalogue, AssetTemplate, AssetHistory, AssetWorkHistory, AssetProcedures, ProcedureDataSets,	X
				AM-ADS (Asset Decision Support)		

IEC document	Use Case title	Pub. status	Description	Actors	XSD Profiles	IEC 62559-2 compliance
				AM-EINV (Substation and Network Inventory)	Procedures, AssetMeasurements, MeasurementValues, MeasurementDetails, Analytics, AssetGroups, AssetHealthEvent, WorkRequest, AssetScores*	
				AM-GINV (Geographical Inventory)		
				MC-MAI		
				MC-SCHD		
61968-4	*SUC – Replace a failing or failed asset*	PRVC	This Use Case describes replacement of a grid asset due to failure. The replacement could be the same product model as the original asset or a different model with equivalent capability. The replacement work is coordinated with grid operations for safety while the work is in progress and quick restoration of function when the work is completed.	AM-AMM (Asset Monitoring and Measurement)	AssetDetails, AssetCatalogue, TypeAssetCatalogue, AssetCatalogue, WorkRequest, OutageSchedules, AssetPSRDetails, MainenanceOrder, AssetWork	X
				AM-ADS (Asset Decision Support)		
				AM-EINV (Substation and Network Inventory)		

IEC document	Use Case title	Pub. status	Description	Actors	XSD Profiles	IEC 62559-2 compliance
				AM-GINV (Geographical Inventory)		
				MC-MAI		
				MC-SCHD		
				NO-NMON		
61968-5	*Distributed Energy Optimization*	*CCDV*				
61968-5	DER Group Creation (§7.1)	CCDV	A mechanism to manage DER in aggregate. This Use Case allows a software entity to define a logical group of DER and to exchange the definition of this group with other applications. The purpose of grouping is subsequent monitoring and management at the group level.	DMS Operator	DERGroups	X
				DERMS (Distributed Energy Resource Management System)		
61968-5	DER Group Maintenance (§7.2)	CCDV	A mechanism to add, remove, or modify the members and/or aggregated	DMS Operator	DERGroups, OperationSet	

IEC document	Use Case title	Pub. status	Description	Actors	XSD Profiles	IEC 62559-2 compliance
			capabilities of a given group of DER	DERMS (Distributed Energy Resource Management System)		
61968-5	DER Group Queries (§7.3)	CCDV	Once a group is created then any system may query to get information about group, including its membership and capabilities. This is accomplished using a "get DERGroups" transaction.	DMS Operator	DERGroups, DERGroupQueries,	
				DERMS (Distributed Energy Resource Management System)		
61968-5	DER Group Connect/Disconnect (§7.7)	CCDV	This is a control function by which all DER in a given group may be disconnected from	DMS Operator	DERGroups	

IEC document	Use Case title	Pub. status	Description	Actors	XSD Profiles	IEC 62559-2 compliance
			or reconnected to the grid. Notionally, a DERMS or other entity providing this service could do so by leveraging the standard “Connect/Disconnect” function that has been identified for individual DER in the IEC standards (specifically EndDeviceControl; IEC 61968-9 Meter Reading and Control). DERGroups allows to selec a DERFunction among: connectDisconnect, frequencyWattCurveFunction, maxRealPowerLimiting , rampRateControl, reactivePowerDispatch, realPowerDispatch, voltageRegulation, voltVarCurveFunction, voltWattCurveFunction	DERMS (Distributed Energy Resource Management System)		
61968-5	DER Group Status Monitoring (§7.4)	CCDV	This Use Case describes a method by which the present status of DER groups may be exchanged between software applications in an enterprise integration environment. It requires that the referenced DER group definition exists in both the status-requesting and status-providing entities.	DMS Operator	DERGroupStatuses, DERGroupStatusQueries	X
				DERMS (Distributed Energy Resource Management System)		
61968-5	DER Group Capability Discovery (§7.8)	CCDV	This Use Case envisions an environment in which one entity knows the present installed capability of the DER group and another entity seeks to understand this	DMS Operator	DERGroups DERGroupQueries	X

IEC document	Use Case title	Pub. status	Description	Actors	XSD Profiles	IEC 62559-2 compliance
			capability.	DERMS (Distributed Energy Resource Management System)		
61968-5	DERGroup Forecast (§7.5)	CCDV	A mechanism for predicting the capabilities and/or status of a group of DER for a given time period in the future. This Use Case describes a method by which forecasts of DER availability may be exchanged between software applications.	DMS Operator	DERGroupForecastQueries DERGroupForecasts	X
				DERMS (Distributed Energy Resource Management System)		
61968-5	DER Group Dispatch (§7.6)	CCDV	A mechanism for requesting that specified capabilities of a group of DER be dispatched to the grid This Use Case describes a method by which the power level of a DER group may be managed. This method is in the form of a request that the power for the group be set to a specified level and dispatched to the grid.	DMS Operator	DERGroupDispatches	
				DERMS (Distributed Energy Resource Management System)		
				DER		
61968-6	*Interfaces for Maintenance and Construction*	*Published*				

IEC document	Use Case title	Pub. status	Description	Actors	XSD Profiles	IEC 62559-2 compliance
61968-6	Carry out planned maintenance with temporary equipment (Id UCR-WG 14 6:20.1)	Published	Request for work is triggered by maintenance and inspection, or by periodic schedule for work. Example activity is tree trimming, which requires two cuts and a temporary generator or major maintenance on a power transformer where temporary facility is required.	MC-MAI	WorkRequest, MaintenanceOrder, Asset*, Map*, OutageBooking*	
				MC-SCHD		
				NO-CTL		
				AM-EINV		
				AM-GINV (Geographical Inventory)		
				MC-FRD		
61968-6	Maintenance of High Voltage Device (Transformer etc.) requested by FRD (Id UCR-WG 14 6:40.1)	Published	This Use Case describes a situation where a field worker identifies maintenance work that is required while performing related or unrelated work in the field, and that maintenance work requires materials and switching.	MC-SCHD	WorkRequest, MaintenanceOrder, SwitchingPlans, SwitchingOrders, BillOfMaterials Asset*, MaterialReturn*	
				NO-CTL		
				OP-SSC		
				AM-GIM		
				MC-FRD		
				AM-EINV		

IEC document	Use Case title	Pub. status	Description	Actors	XSD Profiles	IEC 62559-2 compliance
61968-6	Trouble response or meter service request (Id UCR-WG 14 6:50.1)	Published	It may be necessary to install, remove or configure meters as a consequence of the registration of a new customer, removal of a customer or the switch of a customer from one supplier to another. There may also be the need to change out a meter which involves the removal of the old meter, installation of the new meter and configuration of the new meter as needed by the metering system. Prior to meter installation, subscriptions have been established between the MS and the MDM to receive updates to customer data. This Use Case encompasses both the meter installation and meter removal processes.	CS-CSRV	ServiceOrder, ServiceRequests, OperationSet	
				MC-MWM (Mobile Workforce Management)		
				MC-FRD		
				Field Crew		
				AM-MAM		
				MR-MDM		
				MR-MS		
61968-8	*Interfaces for Customer Operations*	*Published*				
61968-8	Trouble Ticket – Obtain connectivity topology (Id UCR-WG 14 8:10.1)	Published	Many electric utilities depend on the calls from the customers to begin the process to identify the location of the faulted section	CS-TCM	TroubleTicket	

IEC document	Use Case title	Pub. status	Description	Actors	XSD Profiles	IEC 62559-2 compliance
			of the electric distribution circuit. The trouble ticket is the communication mechanism between the utility and the customer that is used to initiate an analysis to determine where best to deploy field personnel for service restoration. The trouble ticket is typically created based on direct conversation with the customer. The trouble ticket is also created based on customer report via an automated call taking system and on an outage report from an AMI meter. The trouble ticket contains the information of a customer call. Once created, the trouble ticket may be sent to the OMS for further processing.	NO-FLT		
61968-8	Incident Information (Id UCR-WG 14 8:20.1)	Published	While the incident information message is generated by the Outage Management System (OMS), it is included in [IEC 61968-8] to complete the interaction between the CIS and the OMS and will be removed from this standard when the message is included in the IEC 61968-3.	NO-FLT	IncidentInformation	
				CS-CSRV		
61968-8	Service Order (Id UCR-WG 14 8:30.1)	Published	Customers initiate service requests as their main point of contact with the utility. Once a service request is received, the CIS sends it to the WMS for further processing.	CS	ServiceRequest	
				MC-SCHD		

IEC document	Use Case title	Pub. status	Description	Actors	XSD Profiles	IEC 62559-2 compliance
61968-8	Service Order (Work Request) (Id UCR-WG 14 8:30.2)	Published	The service order contains the information for a field service technician or crew to perform the work required by the customer. This Use Case shows the work flow between CIS and WMS when a service order message is exchanged.	CS-TCM (Trouble Call Management)	ServiceOrder	
				MC-SCHD		
61968-8	Work Request (Id UCR-WG 14 8:30.3)	Published	The work request is the main point of contact between the customer service organization and the engineering or maintenance organization. This Use Case shows the work request message exchange between the CIS and WMS.	CS	WorkRequest	
				MC-SCHD		
61968-8	Customer Agreement (Id UCR-WG 14 8:40.1)	Published	The customer service agreement documents the terms and conditions between the utility and the Customer for the provision of electricity. Not all utilities require a customer service agreement; however, utilities will assign the rate appropriate for the requested customer connection.	EXT-SAL	CustomerAgreement	
				CS		
61968-9	*Interfaces for meter reading and control*	*ACDV*				

IEC document	Use Case title	Pub. status	Description	Actors	XSD Profiles	IEC 62559-2 compliance
61968-9	Outage Detection, request/reply message exchange (Id UCR-WG 14 9:220)	ACDV	When an outage is not due to a SCADA trip, electric utilities typically depend on the calls from the customers to identify the location of the fault. However, the use of an MS can provide another means to identify the location of trouble. It is often	MR-MDM	EndDeviceEvents	
				MR-AMI		

IEC document	Use Case title	Pub. status	Description	Actors	XSD Profiles	IEC 62559-2 compliance
			possible for an MS to determine that it has lost contact with a meter, in which case this can be reported as an EndDeviceEvent for potential use by an outage management system. It is important to note that loss of communications with a meter may not be sufficient to identify the existence of an outage, as it is common for some MS technologies to occasionally lose contact with meters for brief periods of time. Some MS systems may be prone to false alarms as a result of the particular technology used to communicate with the meters. Many vendors are working to improve their technology and the accuracy of the data. The MDM, much like the role it sometimes plays in cleaning up metered data for billing applications, in many instances, can also play a role in cleaning up outage data supplied by the MS before it is relayed to the OMS. Such a decision, to route outage data through the MDM, depends on the capability of the MS to supply accurate data, the ability of the MDM to clean up data without introducing excessive delays, and the ability of the OMS to tolerate false alarms and delays. To support outage analysis and filtering of bad data, the MS may supply audit-trail data and quality of measurement data for the outage event, much like it supplies audit-trail data for billing reads.	NO-FLT		

IEC document	Use Case title	Pub. status	Description	Actors	XSD Profiles	IEC 62559-2 compliance
61968-9	Outage Detection, request/reply message exchange w/o MDM (Id UCR-WG 14 9:220)	ACDV	Outage management systems analyze the circuit in terms of network topology. The EndDeviceEventType can indicate an event as detected by an end device for consideration in the analysis, as well as other information such as trouble tickets. Where an EndDeviceEvent can indicate a condition of interest that may in fact be an outage, an outage is usually the consequence of outage analysis within an OMS that will group potentially many events together within a single outage. The use of an MDM to broker outage data is at the discretion of the utility. In some deployments, the outage detection request from the OMS may be issued directly to the MS.	NO-FLT	EndDeviceEvents	
				MR-AMI		
61968-9	Outage Detection, publish/subscribe message exchange (Id UCR-WG 14 9:220)	ACDV	While the request/reply exchange is useful whenever the OMS needs supplementary information, some MS are able to self-detect outages. A pub/sub exchange is ideal in these situations.	MR-MDM	EndDeviceEvents	
				MR-AMI		
				NO-FLT		
61968-9	Historical Meter Data Access (Id UCR-WG 14 9:20.1)	ACDV	A distribution network planner may use historical meter reading values as load information for capacity planning purposes.	OP-SIM	MeterReadings	

IEC document	Use Case title	Pub. status	Description	Actors	XSD Profiles	IEC 62559-2 compliance
			This would permit usage to be aggregated to determine loads for a transformer or feeder.	MR-MDM		
61968-9	Billing Inquiry (Id UCR-WG 14 9:30.1)	ACDV	A customer or an internal source may identify a customer billing issue. A meter read request in combination with historical meter reads may be used to resolve the billing issue. This Use Case shows an inquiry being satisfied by data which recently arrived, while later on in the day an inquiry is made which requires a fresh reading from the meter. In some cases the desired data may be accessible from the MDM. In other cases, it may be necessary to issue a read request remotely through the MS, or manually through a meter service request.	CS-CSRV	MeterReadings	
				MR-MDM		
				MR-AMI		
61968-9	Timestamps assigned between systems	ACDV	This Use Case shows the way that timestamps are assigned as values are created and passed between systems.	Calendar	MeterReadings	
				Meter		
				MR-AMI		
				MR-MDM		

IEC document	Use Case title	Pub. status	Description	Actors	XSD Profiles	IEC 62559-2 compliance
61968-9	Interval Data Timestamp Generation	ACDV	Different MR systems work in different ways, but for the purpose of the standard, timestamps denote the end of the interval.	Meter	MeterReadings	
61968-9	Load Control message exchange	ACDV	Load control (a.k.a. direct load control) requests can often be made to an MS for the purpose of load curtailment. This request would typically be initiated from network operations. Not all MS will have load control capabilities.	MR-MDM	Meter Readings, EndDeviceEvents, EndDeviceControls	
				MR-LDC		
				LMS		
61968-9	Exchange for LC unit installation	ACDV	The installation of load control units is usually more labour intensive than installing a meter, but the data exchange requirements are simpler. LC units are different from meters in the sense that they do not require periodic recalibration. Once an LC unit is installed it will probably remain in place for the life of the unit, even if the customer withdraws from the LC program, or if there is a change in tenancy.	AM-MAM	MeterServiceRequests, EndDeviceConfig, MasterDataLinkageConfig	
				CS-CSRV		
				MC-MAI		
				MR-MDM		
61968-9	Change Customer Program with change out (Id UCR-WG 14 9:40.1)	ACDV	Particular metering solutions are usually chosen to fulfil specific metering needs as a result of customer program enrolment. In many cases, a flexible metering solution can provide coverage for a range of customer programs. When a customer transitions from enrolment in one program	MR-AMI	CustomerAgreementConfig, MeterServiceRequests, OperationSet, MeterReadings	
				CS-CSRV		
				MC-MAI		

IEC document	Use Case title	Pub. status	Description	Actors	XSD Profiles	IEC 62559-2 compliance
			to another, it may simply require a change to the meter (or communication module) configuration. In extreme cases it may require a meter change out. Changes to a configuration will need to be communicated amongst the stakeholders.	MR-MDM		
				CustomerServiceRep		
61968-9	Change Customer Program (Id UCR-WG 14 9:40.2)	ACDV	Particular metering solutions are usually chosen to fulfil specific metering needs as a result of customer program enrolment. In many cases, a flexible metering solution can provide coverage for a range of customer programs. When a customer transitions from enrolment in one program to another, it may simply require a change to the meter (or communication module) configuration. Changes to a configuration will need to be communicated amongst the stakeholders, this is an example exchange in which the deployment involves an MDM.	MR-AMI	CustomerAgreementConfig, MeterReadings, MeterConfig,	
				CS-CSRV		
				MR-MDM		
				CustomerServiceRep		
61968-9	Change Customer Program w/o MDM (Id UCR-WG 14 9:40.3)	ACDV	Particular metering solutions are usually chosen to fulfil specific metering needs as a result of customer program enrolment. In many cases, a flexible metering solution can provide coverage for a range of	MR-AMI	MeterReadings, MeterConfig	
				CS-CSRV		

IEC document	Use Case title	Pub. status	Description	Actors	XSD Profiles	IEC 62559-2 compliance
			customer programs. When a customer transitions from enrolment in one program to another, it may simply require a change to the meter (or communication module) configuration. Changes to a configuration will need to be communicated amongst the stakeholders. this is an example exchange in which the deployment lacks an MDM.	CustomerServiceRep		
61968-9	Customer Switching (Id UCR-WG 14 9:50.1)	ACDV	A customer in an open retail market can switch between energy suppliers. This may require reconfiguration and/or reinstallation of the meter. The reconfiguration or meter replacement may be a consequence of a customer changing energy programs at the time of the change of energy supplier. This process would likely involve an on request read as needed for final billing purposes.	MR-AMI	OperationSet, MeterConfig	
				MR-MDM		
				CS-CSRV		
61968-9	Supplier Configuration (Id UCR-WG 14 9:50.2)	ACDV	Information about the supplier (retailer or utility for example) of the service may be configured into MS by means of SupplierConfig message payload.	MR-MDM	ServiceSupplierConfig	
				CS-CSRV		
61968-9	Real Time Price Signal (Id UCR-WG 14 9:100.1)	ACDV	Real-time pricing signals and/or schedules can be sent to an end device via the MS.	NO-CTL	EndDeviceControls,	

IEC document	Use Case title	Pub. status	Description	Actors	XSD Profiles	IEC 62559-2 compliance
			There are several ways this can be accomplished, such as: • price signal issued in real-time identifying a price for a given time interval • time of use (TOU) schedules published, which cause changes in the accumulation foreach TOU Tier • energy price schedules published in advance. Often the EndDeviceGroup can be used to differentiate meters with different contracts or tariffs.	MR-AMI	EndDeviceEvents	
61968-9	Firmware Upgrade (Id UCR-WG 14 9:110.1)	ACDV	For an automated Metering System capable of two-way communication, it may be possible to upgrade the firmware of MS infrastructure in the field, or in some systems the communication assets in the end devices. Changes to the metering system that materially affect its operation shall be communicated to all of the relevant stakeholders.	MR-AMI	EndDeviceConfig	
				MR-MDM		
				AM-MAM		
				CS-CSRV		
61968-9	Auxiliary Agreements	ACDV	Information about customer debt for collection may be configured into MS by means of AuxilaryAgreementConfig message payload.	CS-CSRV	AuxiliaryAgreementConfig	
				MR-MDM		

IEC document	Use Case title	Pub. status	Description	Actors	XSD Profiles	IEC 62559-2 compliance
61968-9	End Device Configuration	ACDV	Information about end devices in service may be configured into MS by means of an EndDeviceConfig message payload.	CS-CSRV	EndDeviceConfig	
				MR-MDM		
61968-9	Meter Configuration	ACDV	Information about the meters in service may be configured into MS by means of MeterConfig message payload.	CS-CSRV	MeterConfig	
				MR-MDM		
61968-9	Usage Point Configuration	ACDV	Information about the usage points may be configured into MS by means of a UsagePointConfig message payload.	CS-CSRV	UsagePointConfig	
				MR-MDM		
61968-9	Service Category Configuration	ACDV	Information about the categories of service (electricity, water, gas for example) may be configured into MS by means of ServiceCategoryConfig message payload.	CS-CSRV	ServiceCategory Config	
				MR-MDM		
61968-9	Pricing Structure Configuration	ACDV	Information about pricing structures may be configured into MS by means of PricingStructureConfig message payload.	CS-CSRV	PricingStructure Config	
				MR-MDM		

IEC document	Use Case title	Pub. status	Description	Actors	XSD Profiles	IEC 62559-2 compliance
61968-9	Create Service Location Configuration (Id UCR-WG 14 9:140.2)	ACDV	Information about the service locations may be configured into MS by means of ServiceLocationConfig message payload.	MR-MDM	ServiceLocationConfig	
				CS-CSRV		
61968-9	Get Receipt Record (Id UCR-WG 14 9:140.3)	ACDV	When MS receives a payment, a receipt is generated and the relevant information about the payment is typically recorded as a receipt record. This information may be accessed by means of ReceiptRecord message payload.	MR-MDM	ReceiptRecord	
				CS-CSRV		
61968-9	Transaction Record (Id UCR-WG 14 9:140.6)	ACDV	Information about the sale of a prepaid token or the receipt of an account payment is typically also recorded by MS in the form a financial transaction record, capturing the relevant details relating to the particular transaction. This information may be accessed by means of TransactionRecord message payload.	MR-MDM	TransactionRecord	
				CS-CSRV		
61968-9	Customer Account Configuration (Id UCR-WG 14 9:140.7)	ACDV	Information about customer accounts may be configured into MS by means of CustomerAccountConfig message payload.	MR-MDM	CustomerAccountConfig	
				CS-CSRV		

IEC document	Use Case title	Pub. status	Description	Actors	XSD Profiles	IEC 62559-2 compliance
61968-9	Customer Configuration (Id UCR-WG 14 9:140.8)	ACDV	Information about customers of the supplier of the service may be configured into MS by means of CustomerConfig message payload.	MR-MDM	CustomerConfig	
				CS-CSRV		
61968-9	Customer Agreement Configuration (Id UCR-WG 14 9:140.10)	ACDV	Information about customer agreements may be configured into MS by means of CustomerAgreementConfig message payload.	MR-MDM	CustomerAgreementConfig	
				CS-CSRV		
61968-9	Meter Connect/Disconnect (Id UCR-WG 14 9:150.1)	ACDV	For a variety of reasons, such as non-payment, it may be necessary to disconnect or reconnect a customer. When disconnected, recorded usage should be zero and out of power complaints should be ignored. When it is not possible to perform a disconnect or reconnect remotely through an MS, a meter service request will typically be issued to perform the disconnect or reconnect manually.	CS-CSRV	EndDeviceControls, EndDeviceEvents, MeterReadings	
				MR-MDM		
				MR-AMI		
61968-9	Meter Connect/Disconnect w/o MDM (Id UCR-WG 14 9:150.2)	ACDV	For a variety of reasons, such as non-payment, it may be necessary to disconnect or reconnect a customer. When	CS-CSRV	MeterReadings, EndDeviceControls,	

IEC document	Use Case title	Pub. status	Description	Actors	XSD Profiles	IEC 62559-2 compliance
			disconnected, recorded usage should be zero and out of power complaints should be ignored. When it is not possible to perform a disconnect or reconnect remotely through an MS, a meter service request will typically be issued to perform the disconnect or reconnect manually.	MR-AMI	EndDeviceEvents	
61968-9	Meter Health Event (Id UCR-WG 14 9:160.1)	ACDV	In some deployments, the MDM will be present to broker meter health data for other stakeholders and potentially take action to initiate corrective actions.	MR-AMI	EndDeviceEvents, MeterServiceRequest	
				MR-MDM		
				CS-CSRV		
				NO-FLT		
				MC-MAI		
61968-9	Meter Health Event w/o MDM (Id UCR-WG 14 9:160.2)	ACDV	Other installations however might not have an MDM or use it in this way. It is possible for the MS to publish data directly to the stakeholders that are equipped to receive it.	AM	EndDeviceEvents, MeterServiceRequest	
				MR-AMI		
				CS-CSRV		
				NO-FLT		
				MC-MAI		

IEC document	Use Case title	Pub. status	Description	Actors	XSD Profiles	IEC 62559-2 compliance
61968-9	Power Quality Event	ACDV	Meters may collect information related to power quality, including but not limited to, momentary outage events, sustained outage events, low or high voltage events, and high distortion events. This information could be used for outage analysis, maintenance scheduling or capacity planning. Power quality events are a subtype of EndDeviceEvent. Power quality events may be brokered (i.e. publications managed) by an MDM.	MR-AMI	EndDeviceEvents	
				MR-MDM		
				LMS		
				NO-FLT		
				MC-MAI		
61968-9	Power Quality Event w/o MDM	ACDV	Meters may collect information related to power quality, including but not limited to, momentary outage events, sustained outage events, low or high voltage events, and high distortion events. This information could be used for outage analysis, maintenance scheduling or capacity planning. Power quality events are a subtype of EndDeviceEvent. Power quality events may be sent directly to the various stakeholders.	AM	EndDeviceEvents, MeterServiceRequest	
				MR-AMI		
				CS-CSRV		
				NO-FLT		
				MC-MAI		
61968-9	PanDevice Controls (Id UCR-WG 14 9:170.1)	ACDV	Additional PAN device controls for purposes other than pairing may be initiated by an enterprise application such as a demand response management system to a metering system head end. These controls also use the EndDeviceControls message. Given that there are a variety of ways that the control	DERMS (Distributed Energy Resource Management System)	EndDeviceControls, EndDeviceEvents	
				MR-MDM		

IEC document	Use Case title	Pub. status	Description	Actors	XSD Profiles	IEC 62559-2 compliance
			can be addressed, there may be many target PAN devices.	MR-AMI		
				Pan Device		
61968-9	PanDevice Pairing (Id UCR-WG 14 9:170.2)	ACDV	The pairing of a PAN device with a meter is required before the PAN device can be sent commands by the Metering System.	CS-CSRV	EndDeviceControls, EndDeviceEvents	
				MR-MDM		
				MR-AMI		
61968-9	PanDevice Events (Id UCR-WG 14 9:170.3)	ACDV	PAN device events are generated by a PAN device, where they are typically communicated through a meter or gateway to the metering system head end. The metering system head end will then publish the message to other enterprise applications that have subscribed.	Pan Device	EndDeviceEvents	
				CS-CSRV		
				MR-MDM		
				MR-AMI		
61968-9	Meter Changeout – EndDeviceEvent (Id UCR-WG 14 9:180.2)	ACDV	EndDeviceEvents can cause an evaluation to occur which results in a request for a meter change out. Meter events may be published from the MS or MDM. This Use Case describes an example exchange where the MDM has identified a problem, and brought it to the attention of the WMS which decides to change out the meter.	MC-MAI	EndDeviceEvent, MeterServiceRequests, OperationSet	
				CS-CSRV		
				MR-MDM		
				MR-AMI		

IEC document	Use Case title	Pub. status	Description	Actors	XSD Profiles	IEC 62559-2 compliance
				Meter Technician		
61968-9	Meter Changeout – CIS Alarm (Id UCR-WG 14 9:180.3)	ACDV	Data analysis by the CIS or customer billing complaints may cause the customer service department to request a site-visit to the customer location and possibly a meter change out.	MC-MAI	MeterServiceRequests, OperationSet	
				CS-CSRV		
				MR-MDM		
				MR-AMI		
				Meter Technician		
61968-9	Meter Changeout Recalibration (Id UCR-WG 14 9:180.5)	ACDV	The WMS or other enterprise systems such as AM may track when meter recalibration is due, and change-out the meter.	MC-MAI	OperationSet	
				CS-CSRV		
				MR-MDM		
				AM-MAM		
				MR-AMI		
				Meter Technician		

IEC document	Use Case title	Pub. status	Description	Actors	XSD Profiles	IEC 62559-2 compliance
61968-9	Meter Installation and removal (Id UCR-WG 14 9:180.6)	ACDV	It may be necessary to install, remove or configure meters as a consequence of the registration of a new customer, removal of a customer or the switch of a customer from one supplier to another. There may also be the need to change out a meter which involves the removal of the old meter, installation of the new meter and configuration of the new meter as needed by the metering system.	CS-CSRV	MeterServiceRequests, OperationSet	
				MC-MAI		
				Meter Technician		
				AM-MAM		
				MR-MDM		
				MR-AMI		
61968-9	Create Meter Read Schedule (Id UCR-WG 14 9:190.1)	ACDV	It is necessary to periodically gather meter readings from a MS for billing through the customer billing system. The request for meter reading should specify a meter or group of meters, a type of reading to collect, and a frequency and duration of interest. The scheduled frequency may consist of regular or irregular periods.	CS-CSRV	MeterReadings, MeterReadSchedule	
				MR-MDM		
				MR-AMI		
61968-9	Manual Meter Reading (Id UCR-WG 14 9:190.2)	ACDV	Meter readings can be obtained manually by a meter reader. Data collected may be maintained by the meter data manager. Meters may collect a number of different measurement types. Some types of meters may measure more than one phase, or may collect values for non-electrical	MR-MDM	MeterReadings	
				CS-CSRV		
				Meter Reader		

IEC document	Use Case title	Pub. status	Description	Actors	XSD Profiles	IEC 62559-2 compliance
			measurements, such as water or gas. A meter reader may input data shown on the panel of meter into a handheld device, which could be regarded as a metering system. Data input may occur several hundred times per day. A meter reader may present an account of the read to the customer. Note that this account is not an invoice. Billing would be generated normally by the CIS even in the manual reading case.	Customer		
				Handheld device		

IEC document	Use Case title	Pub. status	Description	Actors	XSD Profiles	IEC 62559-2 compliance
61968-9	On-Request Meter Reading (Id UCR-WG 14 9:190.3)	ACDV	Meter read requests are issued to a MS in order to obtain meter readings on a per request basis. The MS will send a request to the desired meters. These can be used for billing inquiries, outage extent verification, verification of restoration and other business purposes. Many utilities have a policy of routing all revenue readings through the MDM so that all data will receive the same level of validation. However, not all MDM systems are able to offer validation services for outage data. For those that do, the utility shall weigh the value of MDM validation over the time delay it may introduce, as well as the ability of the particular OMS solution to reject incongruent data. For this reason, the example diagram shows revenue readings routed through the MDM, but outage data routed around it. It is important to note that not all metering systems support "on request" readings. For those that do, the implementation can also vary significantly. On-request reads may be initiated to the MS from systems such as any of the following:	CS-CSRV	MeterReadings	
				MR-MDM		
				MR-AMI NO-FLT		
			• The CIS (in an effort to collect billing determinants). • A Planning and Scheduling application (in an effort to acquire engineering data about the distribution network). • An OMS (in order to verify if a customer is affected by an outage or			

IEC document	Use Case title	Pub. status	Description	Actors	XSD Profiles	IEC 62559-2 compliance
			has been restored). • A meter data management system (in an effort to broker data for any or all of the above applications). • The MS itself may also directly initiate a meter read.			
* This profile is not available.						

7.5 TC 57 WG 14 list of roles used

Document	Actor/Role	Description
BUSINESS ROLES		
IEC 61968-9	People	People parent role
IEC 61968-9	System Administrator	
IEC 61968-9	Customer	One who consumes the service provided by the utility
IEC 61968-9	Designer	
IEC 61968-9	Dispatcher	Person responsible for the controls at the master station
IEC 61968-9	DMS Operator	Operator of the Distribution Management System
IEC 61968-9	GIS Operator (cartographer)	Operator of the Geographical Information System
IEC 61968-9	Meter Reader	
IEC 61968-9	Meter Technician	
IEC 61968-9	Field Crew	Field crew loading analysis and work order scheduling
IEC 61968-9	Work Manager	
IEC 61968-9	Mobile Work Force	
IEC 61968-9	DSO	Entity responsible for the planning, operation and maintenance of the electricity distribution network. (role equivalent to "Distribution Network Operator" and "Distribution Grid Operator" from "IEC TC8 WG6 role model")
IEC 61968-13	TSO	Transmission System Operator
IEC 61968-13	Authority	A third party that analyses the power quality issues
IEC 61968-13	DNO	
SYSTEM ROLES		
IEC 61968-9	AM	Parent Asset Management
IEC 61968-4	AM-AMM (Asset Monitoring and Measurement)	Asset moning and measurement involves inspection, testing, measurement, and monitoring of the assets in order to understand, assess and manage their condition and performance.

Document	Actor/Role	Description
IEC 61968-4	AM-ADS (Asset Decision Support)	Asset decision support involves strategy definition and prioritisation, maintenance strategy planning, risk management, programme management and decision making. The central aspect of asset decision support is analytics. It drives the condition, configuration, performance, operating costs, and flexibility of the asset base, with the aim of maximising value.
IEC 61968-9	AM-EINV (Substation and Network Inventory)	Substation and Network Inventory The electrical substation and network assets that a utility owns, or for which has legal responsibility, and will maintain an accurate asset register developed around an asset hierarchy that supports advanced asset management functions.
IEC 61968-9	AM-GIM (General Inventory Management)	General Inventory Management The non-electrical assets (e.g., tools, concrete, poles, cross-arms, etc.) that a utility owns, or for which has legal responsibility, and will maintain an accurate asset register that
IEC 61968-9	AM-GINV (Geographical Inventory)	Geographical Inventory Management of geospatial data, typically by utilizing computer graphics technology to enter, store, and update graphic and non-graphic information. Geographic depictions and related non-graphic data elements for each entity are typically stored in some form of a data store. The graphic representations are referenced using a coordinate system that relates to locations on the surface of the earth. Information in the data store can be queried and displayed based upon either the graphic or non-graphic attributes of the entities.
IEC 61968-9	AM-MAM (Meter Asset Management)	Meter Asset Management Added to Asset Management as part of 3rd Edition IEC 61968-1.
IEC 61968-9	CS	Customer Service parent
IEC 61968-9	CS-CSRV	Customer Service IEC 61968-8 a.k.a. Customer Information System This function set covers the different aspects related to customer interfaces required for operation and commercial purposes.

Document	Actor/Role	Description
IEC 61968-9	CS-TCM (Trouble Call Management)	Trouble Call Management Customer troubles related to blackouts are transmitted and compared with network data in order to provide accurate information on the incident.
IEC 61968-9	EXT	External actor which represents systems external to the domain defined by WG 14.
IEC 61968-9	EXT-SAL	
IEC 61968-9	EXT-SC	Supply Chain and Logistics (SC) Management of processes for acquiring necessary supplies, tracking acquired and ordered supplies, and their allocation for authorized purposes.
IEC 61968-9	MC	
IEC 61968-9	MC-CON	MC-CON Construction Examples of construction work include service installations, line extensions, and system betterment projects.
IEC 61968-9	MC-DGN	MC-DGN, Design A design is created by an engineer or work planner. Designs can be made up of individual line items or by a set of compatible units□ or CUs. Line items and compatible units are associated with a design location.
IEC 61968-9	MC-FRD	Field Recording Field recording is often accomplished through hand held devices which allow field personnel to view and enter information relevant to the work they are performing in the field. For example, line crews and servicemen can access their respective district maps, do searches by pole number, substation, transformer number, switch numbers, and feeder names.
IEC 61968-9	MC-MAI	MC-MAI Maintenance and Inspection, a.k.a. Work Management System Work involving inspection, cleaning, adjustment, or other service of equipment to enable it to perform better or to extend its service life. Examples of maintenance work are routine oil changes and painting. Examples of inspection work are pole inspections, vault inspections, and substation inspections.

Document	Actor/Role	Description
IEC 61968-9	MC-SCHD	Work Scheduling and Dispatching Work scheduling and dispatching makes it possible, for a defined scope of work, to assign the required resources and keep track of work progress.
IEC 61968-9	MR	Parent Meter Reading system
IEC 61968-9	MR-AMI	Advanced metering infrastructure (AMI)
IEC 61968-9	MR-LDC	Load Control System (LDC) Customers who accept this service option are able to adjust their consumption regarding time-of-use tariffs based on the variation of daily and seasonal cost of power. Automatic (or manual) equipment allows customers to adjust their consumption in response to changes in price (control of electric heating, hot water, large domestic appliances etc.)
IEC 61968-9	MR-MDM	Meter Data Management (MDM) This function collects, validates, stores and distributes readings and event-related data from meters and other end devices to other enterprise functions and systems. The meter data management function supports diverse end-use applications including but not limited to billing, load management, load forecasting, demand response, outage management, asset management and distribution network planning and maintenance. Additionally, the meter data management function frequently provides a common point for management, command and control of metering systems (MS) and the downstream meters and end devices, including PAN devices. Functions supported include bi-directional communications with metering systems and end devices to perform on-demand reads as well as control functions including remote configuration, remote disconnect / reconnect / demand reset operations, and demand response and load control functions. The meter data management function has added importance when utilities have more than one metering system, as this abstract component shields systems and applications such as customer information system, billing and planning from the need to integrate with more than one metering system.
IEC 61968-9	MR-MOP	

Document	Actor/Role	Description
IEC 61968-9	MR-MS	Control and Reconfiguration (MS) The metering system will handle requests and convey meter data, meter events, meter responses, meter system events, and other value-added data to the enterprise. Depending on the metering system, the processing of requests and events may involve multiple steps through public or private networks, licensed or unlicensed RF spectrums, standardized or proprietary systems, in a one-way or two-way fashion. Note that metering systems are significantly diverse with respect to technologies used, protocols used, capabilities and frequency of data collection. The details of the internals of meters, communication transports and protocols are outside the scope of this standard (IEC61968-1). The focus is on the normative message formats (such as IEC61968-9 message types) and recommended implementation schemes for ESB, JMS, and Web Services(IEC61968-100)
IEC 61968-9	MR-RMR	Remote Meter Reading (RMR) – Meter Reading IEC 61968-9 Set of functions required to carry out remote readings of information recorded at the customer's point of supply, as well as those needed to send controls to customer equipment interfaces.
IEC 61968-9	NE	
IEC 61968-9	NE-CSP	Construction Supervision (CSP) Monitoring and management of construction work to minimize negative variances from planned costs, performance, and schedule.
IEC 61968-9	NE-NCLC	Network Extensions – Network Calculations IEC 61968-7 Used to develop a long-term (generally one year and beyond) plan for the reliability (adequacy) of the interconnected electric transmission and distribution networks

Document	Actor/Role	Description
IEC 61968-9	NE-PRJ	Project Definition (PRJ) Planned work activities to enhance or extend the network and/or other assets. Example includes line extension for new housing development, a new substation, switchgear change at a substation. Capital development projects (i.e., not billed to a customer) are usually justified with a business case.
IEC 61968-9	NO	Network Operations parent role
IEC 61968-9	NO-CLC	Network calculations – real-time (CLC) Network calculations provide system operators with the ability to assess the reliability and security of the power system.
IEC 61968-9	NO-CTL	Network Control (NC) Network control is achieved through decentralized control functions which need to be coordinated at an upper level of the control hierarchy Local automatic control functions can be performed using only local information and which do not need knowledge of network connectivity. These functions are supported locally by substation control equipment at substation level. Area network control functions coordinate the local functions. These functions are operator-dependent and are provided firstly by the remote control function and secondly through local control which is related to the orders given to field crews through mobile station terminals.

Document	Actor/Role	Description
IEC 61968-9	NO-FLT	Fault Management (FLT) a.k.a. Outage Management System (OMS) Fault management functions which are intended to enhance the speed at which fault localization and service restoration can be achieved. The fault management function supports the utilities required to identify disruptions in the system, to carry out restoration switching actions and to provide customers with notification of disruptions detected (in terms of duration and cause of breakdown). Fault management makes it possible: • to improve customer complaint response system, providing a prompt reply and a good interface between the Utility and the Customer (better image), • to provide field information to the dispatch operator, helping to restore supply during disruptions, • to compile all information about Quality of Service and make it available outside the Utility (Customers and official entities).
IEC 61968-9	NO-NMON	Network Operation Monitoring (NMON) Provides the means for supervising main substation topology (breaker and switch state) and control equipment status. It also provides the utilities for handling network connectivity and loading conditions. It also makes it possible to locate customer telephone complaints and supervise the location of field crews.
IEC 61968-9	NO-OA	Outage Analysis
IEC 61968-9	NO-OFA	Operation feedback analysis (OFA) Information can be retrieved from substation and customer records and compared with records taken from real-time operation related to information on network incidents, connectivity and loading. This information analysis provides indicators for optimizing periodic maintenance according to fault rates in the network. This requires identification of concurrent values at multiple locations and time tagging of events and values.

Document	Actor/Role	Description
IEC 61968-9	NO-OST	Operation statistics and reporting (OST) Operating statistics and reporting functions makes it possible to archive online data and to perform feedback analysis of system efficiency and reliability.
IEC 61968-9	OP	
IEC 61968-9	OP-IMP	Power import and scheduling optimization (IMP); a.k.a. Load Management System Power import scheduling and optimization aims to minimize the cost of imported power by keeping the average imported power close to the contracted value, making use of peak plants, load switching or load shedding.
IEC 61968-9	OP-SIM	Network Operation Simulation Planning (SIM) This set of functions allows facilities to define, prepare and optimize the sequence of operations required for carrying out maintenance work on the system (release/clearance orders) and operational planning.
IEC 61968-9	OP-SSC	Switch Action Scheduling (SSC) Switch Action and Operation Work Scheduling Switch action scheduling provides supports for handling all aspects relevant to switch order formulation, drawing up operating guidelines, dispatching repair crews, and also supports for informing customers affected. It assists in collecting the related data and delivering it in the various forms required.
IEC 61968-9	DERMS (Distributed Energy Resource Management System)	It is presumed that this function will respond to back-office queries or commands and do the interpretation to the respective DNP3 or IEC 61850 messaging to devices with "smart inverters" in the field. For example, this might be a command to shed load to all devices of a specified type in a geographic area
IEC 61968-9	MMS (Maintenance Management System)	
IEC 61968-9	SCADA	Supervisory Control And Data Acquisition system provides the basic functionality for implementing EMS or DMS, especially provides the communication with the substations to monitor and control the grid.

Document	Actor/Role	Description
IEC 61968-9	Substation	Area or group of equipment containing switches, circuit breakers, busses, and transformers for switching power circuits and to transform power from one voltage to another or from one system to another
IEC 61968-9	IED (Intelligence Electronic Device)	
IEC 61968-9	MC-MWM (Mobile Workforce Management)	a.k.a. – Mobile Dispatching System – typically handles work orders stemming from customer trouble tickets and routine meter removal and exchange activities. Investigation of faulty meter, tamper, theft detection, communications failure
IEC 61968-9	Pan Device	PAN devices are used for a variety of purposes within a customer premise. The meter is often used as a gateway for communication between the head end system and the PAN device. PAN devices may react to control messages or generate EndDeviceEvents. Some PAN devices, such as in-home displays, may also present information to consumers. PAN devices may be configured to react to pricing or other demand response related signals that are issued as EndDeviceControls. PAN devices are modelled as EndDevices in the CIM.
IEC 61968-9	Handheld device	
IEC 61968-9	Meter	Type of "end device" which performs metrology and supports the tariffing of the distribution and/or transmission network
IEC 61968-9	Calendar	
IEC 61968-9	LMS	Load management system. A load management system is used to manage and control load by the utility in order to promote system reliability. A load management system may perform load forecasting, contingency analysis, and other simulations prior to issuing a load control command.
IEC 61968-9	CustomerServiceRep	
IEC 61968-5	DER	Distributed Energy Resource

8 Use Cases and roles of TC 57 WG 15, *Data and Communication Security*

8.1 General

The scope of WG 15, *Data and Communication Security*, is to:

- Undertake the development of standards for security of the communication protocols defined by TC 57, specifically the IEC 60870-5 series, the IEC 60870-6 series, the IEC 61850 series, the IEC 61970 series, and the IEC 61968 series;
- Review and advise on cyber security of TC 57 standards;
- Undertake the development of standards and/or technical reports on end-to-end security issues.

8.2 Documents used

IEC reference	Name	Publication status	Edition
62351-9	Key Management	Published	1
62351-90-2	Deep Packet Inspection (DPI) of encrypted communications	Published	1
62351 – RBAC Use Cases	RBAC Use Cases	?	?

8.3 TC 57 WG 15 Use Case reporting

WG number of identified Use Cases	% of Use Cases described with 62559-2	% of Business Use Cases	% of System Use Cases	Number of roles identified			% of non-defined roles
12	0 %	25 %	75 %	21	42,86 %	57,14 %	60,7 %

8.4 TC 57 WG 15 List of Use Case per normative document

IEC document	Use Case title	Pub. status	Description	Actors	IEC 62559-2 compliance
62351-9	Key renewal triggered by the entities	Published	The renewal of the session key is normally triggered before the 'Remaining Lifetime Value' of the current key has expired. "Remaining Lifetime Value" (a.k.a. lifetime) is one of the parameters returned in the SA TEK payload and it signifies the number of seconds remaining before the SA it is associated with expires.	KDC, GM	
62351-9	Simplified certificate life cycle	Published	Manufacturers need to start the key management life cycle for an entity by providing a security manifest of identity information, such as a manufacturer unique identifier, or one-time-password, or certificate from a CA, or manufacturer's entity certificate for each of their devices and systems. At each change in ownership or even status (e.g. warehoused vs. deployed), new certificates should be registered, providing a trusted supply chain of product identity. When these entities are eventually deployed, their operational certificates are used to enroll the entity in operations so that they can be authenticated and commence their information exchanges. Shortly before these operational certificates are due to expire, they should be renewed.	Device/Integrator Vendor, System Owner, Device	
62351-9	Example of the SCEP entity enrolment and CSR process	Published	Enrolment is the process by which the entity receives a signed certificate from the CA.	Entity, Registration Authority, Certificate Authority	

IEC document	Use Case title	Pub. status	Description	Actors	IEC 62559-2 compliance
62351-9	Example of the EST entity enrolment and CSR process	Published	Enrolment is the process by which the entity receives a signed certificate from the CA.	Entity, Registration Authority, Certificate Authority	
62351-9	SCEP certificate renewal	Published	When certificates are ready to expire, entities need to apply for certificate renewal using a similar but simpler process than enrolment. Simpler in that the certificate update can already utilize the available certificate information on the respective clients.	Device, Registration Authority, Certificate Authority	
62351-9	EST certificate renewal/rekeying	Published	When certificates are ready to expire, entities need to apply for certificate renewal using a similar but simpler process than enrolment. Simpler in that the certificate update can already utilize the available certificate information on the respective clients.	Device, Registration Authority, Certificate Authority	
62351-90-2	Monitoring and auditing requirements – Use cases from utilities	Published	Ensuring reliable 24/7 operation of power systems requires: 1) The visibility of communication details, to validate correct behaviour and troubleshoot issues coming from software bugs, hardware malfunctions and/or network failures. 2) The need to continuously validate that the given security requirements are always applied and not bypassed, temporarily or permanently after the first acceptance tests of the system.		

IEC document	Use Case title	Pub. status	Description	Actors	IEC 62559-2 compliance
62351-90-2	Monitoring and auditing requirements – Use cases from vendors	Published	Automation vendors implement and maintain the hardware and software equipment behind utilities' infrastructures. The need to monitor encrypted channels can be analyzed considering the different communications happening in the system: 1) Configuration communication between tool (client) and devices/IEDs (servers): when encrypted, a TLS communication is often used to perform these tasks. Monitoring this kind of communication can help to spot attacks trying to upload bad configuration data to the IED. 2) SV (Sample Values) going to or coming from external sources, integrity checked with IEC TS 62351-6. Monitoring this communication can spot if fake data is being injected into the network and used to alter the process. 3) User authentication at GUIs/Applications/Tools: LDAP communication protected with TLS (with Windows protocols or IEC TS 62351-8). It can be interesting to inspect these steps to detect specific attacks to the authentication system. 4) Applications/Tools Browser GUIs: HTTPS. Attacks targeting HTTP/HTTPS endpoints are worth analyzing to prevent several kinds of issues on the server side. 5) Patching: should be delivered via TLS. This is worth monitoring to help detect malicious updates being delivered to IEDs or other system components.		

IEC document	Use Case title	Pub. status	Description	Actors	IEC 62559-2 compliance
62351-90-2	Monitoring and auditing requirements – Encrypted SIP Calls Recording	Published	Citing words in the IETF work, call recording is an important feature in enterprise telephony applications. Some industries such as financial traders have requirements to record all calls in which customers give trading orders. In others, calls are recorded, as the near ubiquitous announcement says, "for training and quality control purposes". Yet in others, all calls are not recorded, and only statistical audits are done.		
62351 – RBAC Use Cases	Cyber Security incident / awareness	?	This Use Case describes the management of RBAC in situation of Cybersecurity incident or awareness. If the utility can detect early sign of massive intrusion, the cybersecurity manager can declare that the utility is in cybersecurity state of alert.	SECADM, Limited, Blocked, Operator, SECAUD	
62351 – RBAC Use Cases	Voltage Control	?	*Description not yet inserted* *Contains sub-domains*	*See below*	
	DSO Control Centre	?	-	Viewer, Operator, Installer, Engineer	
	DSO ICT	?	-	Viewer, Engineer, SECADM, SECAUD, Operator, Installer, RBACMNT	

IEC document	Use Case title	Pub. status	Description	Actors	IEC 62559-2 compliance
	DSO SUB	?	-	Viewer, Operator, Installer, Engineer	
62351 – RBAC Use Cases	Access Token	?	Except the definition of roles and rights, the handling of access tokens to transport the roles is also crucial when mapped into the VC Use Case. According to IEC 62351-8, the access tokens can be applied using two different models: one is the PUSH model, where the subject fetches RBAC access tokens from the repository before accessing the object; the other is the PULL model, where the object fetches the access tokens from a repository after connection establishment with the subject.	MGVC, SAS, ICT Maint DSO	

8.5 TC 57 WG 15 list of roles used

IEC document	Actor name	Actor description	Subactor	Subactor description
BUSINESS ROLES				
62351-9	Device/Integrator Vendor			
62351-9	System Owner		Registration Authority	Those aspects of the responsibilities of a certification authority that are related to identification and authentication of the subject of a public-key certificate to be issued by that certification authority
			Certificate Authority	CAs may be operated either by an organization itself, allowing for a closed, organization-controlled communication group, or by a third party (service provider, system operator or grid manager) that is publicly accepted and hence has a wider scope of trust. Third-party CAs require a secure method for ensuring the valid identity of any new entity, which can range from in-person validation for humans to business-entity validation and to security chains of digital certificates linking previously validated digital certificates to new digital certificates.
62351 UC	Viewer			

IEC document	Actor name	Actor description	Subactor	Subactor description
62351 UC	Operator			
62351 UC	Installer			
62351 UC	Engineer			
62351 UC	DSO	Distribution System Operator		
SYSTEM ROLES				
62351-9	KDC	Key Distribution Centre. Centre which, in an IEC 62351-9 context, provides a network service that supplies temporary (symmetrical) session keys to predefined set of peers after successful authentication		
62351-9	GM	Group Member. Authorized member of a secure group, sending and/or receiving IP packets related to the group		
62351-9	Device			
62351 UC	SECADM			
62351 UC	RBACMNT			
62351 UC	SECAUD			
62351 UC	SECADM			
62351 UC	Limited	Only key personal can have this role		
62351 UC	Blocked	Nobody should have this access		
62351 UC	SAS			

IEC document	Actor name	Actor description	Subactor	Subactor description
62351 UC	ICT			
62351 UC	MGVC			

9 Use Cases and roles of TC 57 WG 16 "Deregulated Market Communications"

9.1 General

The scope of WG 16, *Deregulated Market Communications*, is to develop Standards for Electricity Market Communications and use of the TC 57 Common Information Model (CIM).

9.2 Documents used

IEC reference	Name	Publication status	Edition
62325-451-1	Acknowledgement business process and contextual model for CIM European market	Published	2
62325-451-2	Scheduling business process and contextual model for CIM European market	Published	1
62325-451-3	Transmission capacity allocation business process (explicit or implicit auction) and contextual models for European market	Published	1
62325-451-4	Settlement and reconciliation business process, contextual and assembly models for European market	Published	2
62325-451-5	Problem statement and status request business processes, contextual and assembly models for European market	Published	1
62325-451-6	Publication of information on market, contextual and assembly models for European style market	Published	2
62325-451-7	ENTSO-E Reserve Resource Process	Planned	1
62325-451-8	ENTSO-E HVDC Link	Planned	1
62325-451-9	Capacity Calculation	Planned	1
62325-451-10	My Energy Data	Planned	1
62325-451-11	Planning Outage	Planned	1
62325-103	Review of information exchanges within the downstream European energy market from a CIM perspective	Published	1

9.3 TC 57 WG 16 Use Case reporting

WG number of identified Use Cases	% of Use Cases described with 62559-2	% of Business Use Cases	% of System Use Cases	Number of roles identified			% of non-defined roles
59	1,7 %	100 %	0 %	23/37*	100 %	0 %	0 %/64,9[a]

[a] The roles of WG 16 are divided between those from the ebIX, EFET and ENTSO-E role model and the others, hence the two numbers that respectively characterize these two parts. As all actors from the Harmonized Role Model are defined, 0 % is attributed to this part.

Number of unknown profiles: 3

9.4 TC 57 WG 16 List of Use Case per normative document

IEC document	Use Case title	Pub. status	Description	Actors	Profiles	IEC 62559-2 compliance
62325: FRAMEWORK FOR ENERGY MARKET COMMUNICATIONS						
62325-451-1: *Acknowledgement business process and contextual model for CIM European market*		Published				
62325-451-1	Acknowledge-ment business process	Published	The acknowledgment business process is generic and can be used in all the electricity market business processes at two levels: • system level – to detect syntax errors (XML parsing errors, etc.); • application level – to detect semantic errors (invalid data, wrong process, etc.). If there is a problem encountered at the first level, then a technical acknowledgement may be sent to inform the originator of the problem. If errors are encountered at the second level or if the application can successfully process the information, then an application acknowledgement may be sent to inform the originator of the situation.	Originator, Recipient	iec62325-451-1-acknowledgement_v8_0	

IEC document	Use Case title	Pub. status	Description	Actors	Profiles	IEC 62559-2 compliance
IEC 62325-451-2: *Scheduling business process and contextual model for CIM European market*		Published				
IEC 62325-451-2	Nominate with acknowledge-ment only	Published	This is the simplest form of nomination and could be used where a market operator or a Nomination validator provide nomination information to the transmission system operator. In such a case, the transmission system operator does not need to match the nominations of each counterpart as they have been validated by an external trusted third party.	Market Participant, Transmis-sion System Operator	iec62325-451-1-acknowledgemen t_v8_0	
IEC 62325-451-2	Nominate with acknowledge-ment, confirmation and anomaly	Published	This is the case for OTC trades, where market participants individually submit their nominations to the transmission system operator who carries out the following steps:	Market Participant, Transmissio n System Operator	iec62325-451-2-anomaly_v5_1, iec62325-451-1-acknowledgemen t_v8_0	

IEC document	Use Case title	Pub. status	Description	Actors	Profiles	IEC 62559-2 compliance
			* Verifies that the schedule is coherent independently from the counter nomination. At the end of the verification process an acknowledgement document is transmitted informing the market participant of the results of the initial verification. * On reception of the nomination from the counter party the nominations are matched and if any mismatches are identified an anomaly report is submitted to both parties. A time driven event may be provided in order to verify that nominations from one party without a nomination from a counter party are taken into consideration and the appropriate anomaly report can be generated. * Just prior to the closure of a given period an intermediate confirmation report may be transmitted to the market participants informing them of the situation of their nominations and eventually what will happen to nominations where there are outstanding anomalies. * At the closure of a given period a final confirmation report is transmitted to the market participants informing them of what will be effectively scheduled from their nominations.			

IEC document	Use Case title	Pub. status	Description	Actors	Profiles	IEC 62559-2 compliance
IEC 62325-451-2	Nominate with acknowledge-ment and confirmation	Published	Can be used where the transmission system operator does not provide anomaly information and consequently it reflects the second case without the anomaly report step. It is also more generally used in the transmission system operator to transmission system operator allocation of interconnection capacity in the case of international trades. This process is carried out to ensure that the nominations on each side of the transmission system.	Market Participant, Transmis-sion System Operator	iec62325-451-2-confirmation_v5_0, iec62325-451-1-acknowledgement_v8_0	
IEC 62325-451-2	Transmit planned schedules	Published	The transmission system operator has to be informed of the commodity trades made by the market participant, either through a third party, such as market operator (power exchange) or a nomination validator (coordinated international OTC trade), or with another market.	Market Information Aggregator, Transmis-sion System Operator	iec62325-451-2-schedule_v5_1	
IEC 62325-451-3: *Transmission capacity allocation business process (explicit or implicit auction) and contextual models for European market*		Published				

IEC document	Use Case title	Pub. status	Description	Actors	Profiles	IEC 62559-2 compliance
IEC 62325-451-3	Establish offered capacity	Published	The establishment of the offered capacity is common to both explicit and implicit auction process. The process necessary to constitute an auction specification is initiated by the system	Capacity Trader, Nomination Validator, Capacity Coordinator, System Operator, Transmission Capacity Allocator, Market Information Aggregator	iec62325-451-3-auctionspecification_v7_1, iec62325-451-3-capacity_v8_0, iec62325-451-3-rights_v7_0	
IEC 62325-451-3	Explicit auction process	Published	Steps • the submission of bids, the allocation process of capacity rights and the publication of allocated capacity rights. • description of the resale of capacity rights and the capacity curtailment process for security reason. • description of the nomination of capacity rights.	Capacity Trader, Nomination Validator, System Operator, Transmission Capacity Allocator, Market Information Aggregator	iec62325-451-3-allocation_v7_0, iec62325-451-3-bidDocument_v7_0, iec62325-451-3-capacity_v8_0, iec62325-451-3-publication_v7_1, iec62325-451-3-rights_v7_0, iec62325-451-3-totalallocation_v7_0, iec62325-451-2-confirmation_v5_0, iec62325-451-2-schedule_v5_1	

IEC document	Use Case title	Pub. status	Description	Actors	Profiles	IEC 62559-2 compliance
IEC 62325-451-3	Implicit auction process	Published	The implicit auction is characterized by the fact that the trade responsible party bought both energy and transmission capacity at the same time. Thus the distinction between the role of capacity trader and interconnection trade responsible is not necessary for this business process	Trade Responsible Party, Market Operator, System Operator, Market Information Aggregator	iec62325-451-3-implicitAuction_v7_0, iec62325-451-3-publication_v7_1, iec62325-451-1-acknowledgement_v8_0	
IEC 62325-451-4: *Settlement and reconciliation business process, contextual and assembly models for European market*		Published				

IEC document	Use Case title	Pub. status	Description	Actors	Profiles	IEC 62559-2 compliance
IEC 62325-451-4	Settlement/ reconciliation	Published	The settlement or reconciliation process takes place once the market and operation processes have been completed from the long term planning down to the intraday market and through the day ahead market as well as the real time operations of the bulk power system. The settlement or reconciliation process is composed of three basic activities. • The first activity is the computation and aggregation per balance responsible party of all agreed transactions including over the counter transactions, cross-border transactions, power exchange transactions, and balancing transactions. • The second activity is the computation and aggregation per balance responsible party of all the accounting energy values, measured, estimated, or profiled for its physical injection or withdrawal. • The third activity is the settlement or reconciliation of these values, i.e. computes the imbalances and establishes the imbalance settlement amounts.	Nomination Validator, Balance Responsible Party, Metered Data Aggregator, System Operator, Billing Agent, Imbalance Settlement Responsible, MOL Responsible	iec62325-451-4-settlement_v4_0, iec62325-451-2-confirmation_v5_0, iec62325-451-1-acknowledgement_v8_0	

IEC document	Use Case title	Pub. status	Description	Actors	Profiles	IEC 62559-2 compliance
IEC 62325-451-5: *Problem statement and status request business processes, contextual and assembly models for European market*		Published				
IEC 62325-451-5	Status Request	Published	This process will enable the initiator to receive the status of his transaction prior to its termination or the status of his overall situation. This will eventually enable him to react and expedite missing information prior to a transactions conclusion or carry out other actions to actualize his situation.	Market Participant, Responsible Operator	iec62325-451-5-problem_v3_0, iec62325-451-5-statusrequest_v4_0, iec62325-451-1-acknowledgement_v8_0	

IEC document	Use Case title	Pub. status	Description	Actors	Profiles	IEC 62559-2 compliance
IEC 62325-451-6: *Publication of information on market, contextual and assembly models for European style market*		Published				
IEC 62325-451-6	Market information publication process	Published	The market information publication (transparency) business process enables all the relevant information concerning the electricity markets to be made available in a transparent and coherent fashion. The availability of such information is vital for market participants to take efficient production, consumption and trading decisions. Deeper market integration and the rapid development of intermittent renewable energy generation sources such as wind and solar require the disclosure of complete, timely available, high quality and easily digestible information relating to supply and demand fundamentals (EU Commission Regulation No 543/2013).	Data Provider, Capacity Coordinator, Transmis-sion Capacity Allocator, Party connected to the grid, Market Information Aggregator, Market Operator, Information Receiver	iec62325-451-6-balancing-4-0, iec62325-451-6-configuration_v3_0, iec62325-451-6-generationload_v3_1, iec62325-451-6-outage_v4_0, iec62325-451-3-publication_v7_1, iec62325-451-6-transmissionnetwork_v4_0	
IEC 62325-451-7: *ENTSO-E Reserve Resource Process*		Planned				

IEC document	Use Case title	Pub. status	Description	Actors	Profiles	IEC 62559-2 compliance
ERRP Implementation Guide	The system operator / resource provider resource reserve process	Planned	The System Operator / Resource Provider balance Management Model describes the different basic processes that are generally carried out within markets that operate such a model. The focus of this guide is from the tendering of reserve requirements to the activation phase of reserve requirements from different resources that take place both during the day ahead planning phase and the operational phase where the initial schedule may have to be updated to cater for unforeseen events.	Resource Provider, Reserve Allocator, System Operator, MOL Responsible	iec62325-451-7-activationdocument_v6_0, iec62325-451-7--moldocument_V7_1, iec62325-451-7-plannedressourceschedule_v6_0, iec62325-451-7-redispatchdocument_v6_0, iec62325-451-7-reservationallocationresult_v6_0, iec62325-451-7-reservebiddocument_v7_1, iec62325-451-7-resourcescheduleanomaly_v6_0, iec62325-451-7-resourcescheduleconfirmation_v6_0, iec62325-451-3-totalallocation_v7_0, iec62325-451-2-schedule_v5_1, iec62325-451-1-acknowledgement_v8_0	

IEC document	Use Case title	Pub. status	Description	Actors	Profiles	IEC 62559-2 compliance
ERRP Implementation Guide	The system operator / system operator resource reserve process	Planned	The System Operator – System Operator Resource Reserve process, which corresponds to Model 2. The blue colored Use Cases are those which are of interest to the System Operator – System Operator reserve process. The tendering process itself is similar in both model 1 and model 2. This process is fully described under the description of model 1.	Resource Provider, Reserve Allocator, System Operator, MOL Responsible	iec62325-451-7-activationdocument_v6_0, iec62325-451-7-reservebiddocument_v7_1, iec62325-451-1-acknowledgement_v8_0	
ERRP Implementation Guide	The cross border redispatch process	Planned	The Cross Border Redispatch process is divided into phases that are carried out between participating System Operators: 1) Mutually agree Cross Border Redispatch policy 2) Establish daily cross border schedule 3) Identify operation congestion situation 4) Agree Congestion and Security Management 5) Settle incurred costs	System Operator, Market Participant	iec62325-451-7-redispatchdocument_v6_0, iec62325-451-1-acknowledgement_v8_0	
IEC 62325-451-8: *ENTSO-E HVDC Link*		Planned				
HVDC Link Process Implementation Guide	HVDC scheduling process	Planned	The HVDC scheduling process is based on the sequence of successive and dependent data exchanges between the TSOs, which are necessary to determine and agree about the HVDC schedules	System Operator	iec62325-451-8-hvdclinkdocument_v1_0	
IEC 62325-451-9: *Capacity Calculation*		Planned				

IEC document	Use Case title	Pub. status	Description	Actors	Profiles	IEC 62559-2 compliance
ENTSO-E generation and load shift key implementation guide	Generation and load shift key process	Planned	The GSK and LSK are computed by the TSO in charge of the area and provided to the actors who needs to carry out network studies; these network studies could be coordinated transmission capacity calculation, flow-based market coupling, network studies, etc.	Transmission System Operator, Capacity Coordinator	iec62325-451-n-glsk_v2_1, iec62325-451-1-acknowledgement_v8_0	
ENTSO-E contingency list, remedial actions and additional constraints (CRAC) implementation guide	Coordinated capacity calculation process	Planned	The business process described in this document focuses on the exchange of contingency list, remedial actions and additional constraints used for the coordinated capacity calculation processes (Flow Based or NTC capacity calculation).	Transmission System Operator, Capacity Coordinator, Market Operator, Market Information Aggregator	iec62325-451-n-crac_v2_1, iec62325-451-n-glsk_v2_1, IndividualGridModel	
ENTSO-E critical network element implementation guide	Critical network elements process	Planned	The business process described in this document is related to the determination of the critical network elements and their publication for capacity allocation purposes.	Transmission System Operator, Capacity Coordinator, Market Operator, Market Information Aggregator	iec62325-451-n-cne_v2_0, iec62325-451-3-allocation_v7_0, iec62325-451-3-capacity_v8_0	

IEC document	Use Case title	Pub. status	Description	Actors	Profiles	IEC 62559-2 compliance
IEC 62325-451-10: *My Energy Data*		Planned				
IEC 62325-451-10	Deliver regulated services based on data provision	Planned	The Generic Business Use Case describes how the Metering Data Manager transmits consumption data to Consumers or Authorised Third Parties while respecting relevant data privacy issues.	Consumer, Metered Data User, Metering Data Manager	eumed_market*, eumed_metering*	X
IEC 62325-451-11: *Planning Outage*		Planned				
ENTSO-E Outage Business Process And Format	Outage Planning and Coordination process	Planned	Each TSO participates in the outage planning and coordination in accordance with the principles described in the OPS (SO GL) in order to monitor the availability status of its relevant assets and coordinate their availability plans to ensure the operational security of the transmission system.	Transmis-sion System Operators, (C)DSOs, Facility Owners, Regional Security Coordinator, Outage Planning Agent, NRAs		
IEC 62325-103: *Review of information exchanges within the downstream European energy market from a CIM perspective*		Published				

IEC document	Use Case title	Pub. status	Description	Actors	Profiles	IEC 62559-2 compliance
IEC 62325-103	The Measure process and its Use Cases within the European Energy Market	Published		Metered Data Collector, Metered Data Responsible, Metered Data Aggregator		
IEC 62325-103	The business areas for Measure within the European Energy Market	Published	In the model for Measure the business areas contain business processes as clustered around the responsible role. In this way Collect is clustered around the role Metered Data Collector, Validate is clustered around the role Metered Data Responsible and Aggregate is clustered around the role Metered Data Aggregator	Metered Data Collector, Metered Data Responsible, Metered Data Aggregator		
IEC 62325-103	The business areas for Structure within the European Energy Market	Published	The Structure Use Case is split into the Business Areas "Metering Point Administration", "Metering Configuration Characteristics Administration" and "Customer administration", each having different responsible roles. Regarding Customer administration –for which the Use Cases are not further detailed in this Technical Report – the Party Administrator, in a supply centric model, is mapped to the Harmonized role Balance supplier.	Meter Administrator, Party Administrator, Metering Point Administrator		
IEC 62325-103	The business process Use Case for Collect	Published	Providing collected data by a Collector to other partners in the energy sector.	Collector		

IEC document	Use Case title	Pub. status	Description	Actors	Profiles	IEC 62559-2 compliance
IEC 62325-103	Use case for the Business Process Exchange Collected Data	Published		Collector, Validator		
IEC 62325-103	Use case for the Business Process Request Collected Data	Published		Collector, Validator		
IEC 62325-103	The Business Process Use Case for Measure for Reconciliation	Published	Provides validated data for use in the reconciliation process to partners involved in this process.	Validator		
IEC 62325-103	Use case for the Business Process Exchange Validated Data for Reconciliation	Published		Validator, Reconciliatory		
IEC 62325-103	The Business Process Use Case for Measure for Imbalance Settlement	Published	Provides validated and aggregated data for use in the imbalance settlement process to partners involved in this process.	Validator, Aggregator		

IEC document	Use Case title	Pub. status	Description	Actors	Profiles	IEC 62559-2 compliance
IEC 62325-103	Use case for the Business Process Validate for Imbalance Settlement	Published		Validator		
IEC 62325-103	Use case for the Business Process Aggregate for Imbalance Settlement	Published		Aggregator		
IEC 62325-103	Use case for the Business Process Measure for Billing	Published	Provides validated metered data for the processes of billing energy and billing grid cost.	Validator		
IEC 62325-103	Use case for the Business Process Exchange Validated Data for Billing	Published		Validator, Energy Supplier, Grid Company		
IEC 62325-103	Use case for the Business Process Exchange Validated Data for Labeling	Published	Provides validated data for use in the labeling process to partners involved in this process.	Validator, Certificate Issuer		

IEC document	Use Case title	Pub. status	Description	Actors	Profiles	IEC 62559-2 compliance
IEC 62325-103	The Business Process Use Case for Recalculate Calorific Value	Published	Providing established calorific value by a Calorific Value Calculator (which often is the TSO or DSO) to a Supplier or DSO (in its capacity of Calorific Value Calculator) in the gas sector. The Calorific Value is established in a series of (re-)calculations.	Calorific Value Calculator, DSO, Supplier		
IEC 62325-103	Use case for the Business Process Exchange Established Calorific Value	Published		Calorific Value Calculator, DSO, Supplier		
IEC 62325-103	The Business Process Use Case for Settle	Published	Within the Settle process, the Imbalance settlement process is described in the IEC 62325-451-4 standard reference [6]. The sub process Establish Profiled Volume describes the use of master and/or measured data for the planning, settlement and reconciliation of consumption at profiled Metering points. And the sub process Reconciliation handles the final settlement for profiled Metering points.	Settlement Responsible, Metered Data Aggregator, Reconcilia-tory		
IEC 62325-103	The Business Process Use Case for Establish Profiled Volume	Published	The use of master and/or measured data for the planning, settlement and reconciliation of consumption at profiled Metering Points	Metered Data Aggregator		

IEC document	Use Case title	Pub. status	Description	Actors	Profiles	IEC 62559-2 compliance
IEC 62325-103	Use case for the Business Process Use of Analytic Profiles	Published		Metered Data Aggregator, Reconcilia-tory		
IEC 62325-103	Use case for the Business Process Use of Synthetic Profiles	Published		Accountable, Metered Data Aggregator, Settlement Responsible		
IEC 62325-103	Use case for the Business Process Exchange residual volume	Published		Settlement Responsible, Reconcilia-tory		
IEC 62325-103	Use case for the Business Process Exchange Aggregated Profiled Consumption	Published		Metered Data Aggregator, Reconcilia-tory		
IEC 62325-103	The Business Process Use Case for Reconciliation	Published	The party accountable for the final settlement of imbalance for a profiled Metering Point is financially charged for this imbalance.	Reconcilia-tory, Reconcilia-tion Price Setter, Accountable, Billing Agent		

IEC document	Use Case title	Pub. status	Description	Actors	Profiles	IEC 62559-2 compliance
IEC 62325-103	Use case for the Business Process Reconcile Volumes	Published		Reconcilia-tory		
IEC 62325-103	Use case for the Business Process Exchange Reconciled Volumes	Published		Reconcilia-tory, Billing Agent		
IEC 62325-103	Use case for the Business Process Determine Price for Reconciliation	Published		Reconcilia-tion Price Setter		
IEC 62325-103	Use case for the Business Process Exchange Price for Reconciliation	Published		Reconcilia-tion Price Setter, Billing Agent		
IEC 62325-103	Activity diagram for the Business process Exchange Price for Reconciliation	Published		Reconcilia-tion Price Setter, Billing Agent		

IEC document	Use Case title	Pub. status	Description	Actors	Profiles	IEC 62559-2 compliance
IEC 62325-103	Use case for the Business Process Prepare Billing for Reconciliation	Published		Billing Agent		
IEC 62325-103	Use case for the Business Process Exchange Price – Volume Combination	Published		Billing Agent, Accountable		
IEC 62325-103	Use case for the Business Process Determine Meter Read	Published	Provides validated meter read for processes that need an independently established status by means of a meter read for the moment of change.	Initiating Role, Validator		
IEC 62325-103	Use case for the Business Process Initiate Meter Read	Published		Initiating Role		
IEC 62325-103	Use case for the Business Process Notify Need for Meter Read within the Use Case Initiate Meter Read	Published		Initiating Role, Validator		

IEC document	Use Case title	Pub. status	Description	Actors	Profiles	IEC 62559-2 compliance
IEC 62325-103	Use case for the Business Process Make Supply Contract	Published		Customer, Balance Supplier		
IEC 62325-103	Use case for the Business Process Request Change of Supplier	Published	This is the process where a New Balance Supplier (together with the Balance Responsible Party) will be registered in the Metering Point register as the New Supplier for the Metering Point. The Metering Point Administrator makes all necessary updates for the Change of Supplier, including distribution of master data for alignment of the business partner databases.	New Balance Supplier, Metering Point Administra-tor		
IEC 62325-103	Use case for the Business Process Notify Change of Supplier	Published		New Balance Responsible Party, Metering Point Administra-tor, Old Balance Supplier, Old Balance Responsible Party, New Transport Capacity Responsible Party, Old Transport Responsible Party		

IEC document	Use Case title	Pub. status	Description	Actors	Profiles	IEC 62559-2 compliance
IEC 62325-103	Use case for the Business Process Request Change of Balance Responsible Party	Published	This is the process where a New Balance Responsible Party will be registered in the Metering Point register at the request of the Balance Supplier for the Metering Point. The Metering Point Administrator makes all necessary updates for the change, including distribution of master data for alignment of the business partner data bases.	Balance Supplier, Metering Point Administra-tor		

IEC document	Use Case title	Pub. status	Description	Actors	Profiles	IEC 62559-2 compliance
IEC 62325-103	Use case for the Business Process Notify MP characteristics	Published		Metering Point Administrator, Balance Responsible Party, Balance Supplier, Grid Access Provider, Meter Administrator, Metered Data Aggregator, Metered Data Collector, Metered Data Responsible, Reconciliation Responsible, Transport Capacity Responsible Party		

IEC document	Use Case title	Pub. status	Description	Actors	Profiles	IEC 62559-2 compliance
IEC 62325-103	Use case for the Business Process Notify metering configuration characteristics	Published	This is the process where an Initiator (Market Role), i.e.: * Balance Supplier * Grid Access Provider * Meter Operator * Metered Data Collector * Metered Data Responsible can align its metering configuration characteristics with the Meter Administrator. The process is aimed to exchange information for all meters in a Metering point.	Meter Administrator, Metered Data Collector, Balance Supplier, Metered Data Responsible, Meter Operator, Grid Access Provider		
* This profile is not available ** This profile comes from CGMES						

9.5 TC 57 WG 16 list of roles used

IEC document	Actor / Role	Actor / Role description	Subactor	Subactor / Subrole description
BUSINESS ROLES				
ROLES OUT OF THE ebIX, EFET, ENTSO-E HARMONIZED ROLE MODEL				
IEC 62325-451-2, IEC 62325-451-3, IEC 62325-451-4	Market Participant	Generic Role.	Nomination Validator	Has the responsibility of ensuring that all capacity nominated is within the allowed limits and confirming all valid nominations to all involved parties. He informs the Interconnection Trade Responsible of the maximum nominated capacity allowed. Depending on market rules for a given interconnection the corresponding System Operators may appoint one Nomination Validator.
			Market Operator	The unique power exchange of trades for the actual delivery of energy that receives the bids from the Balance Responsible Parties that have a contract to bid. The Market Operator determines the market energy price for the Market Balance Area after applying technical constraints from the System Operator. It may also establish the price for the reconciliation within a Metering Grid Area.

IEC document	Actor / Role	Actor / Role description	Subactor	Subactor / Subrole description
IEC 62325-451-2, IEC 62325-451-3, IEC 62325-451-6	Market Information Aggregator	A party that provides market related information that has been compiled from the figures supplied by different actors in the market. This information may also be published or distributed for general use. NOTE The Market Information Aggregator may receive information from any market participant that is relevant for publication or distribution.		
IEC 62325-451-3	Capacity trader	A party that has a contract to participate in the Capacity Market to acquire capacity through a Transmission Capacity Allocator. NOTE The capacity may be acquired on behalf of an Interconnection Trade Responsible or for sale on secondary capacity markets.		
IEC 62325-451-3, IEC 62325-451-6	Capacity coordinator	A party, acting on behalf of the System Operators involved, responsible for establishing a coordinated Offered Capacity and/or NTC and/or ATC between several Market Balance Areas.		

IEC document	Actor / Role	Actor / Role description	Subactor	Subactor / Subrole description
IEC 62325-451-3, IEC 62325-451-4	System Operator	A party that is responsible for a stable power system operation (including the organisation of physical balance) through a transmission grid in a geographical area. The System Operator will also determine and be responsible for cross border capacity and exchanges. If necessary he may reduce allocated capacity to ensure operational stability. Transmission as mentioned above means "the transport of electricity on the extra high or high voltage network with a view to its delivery to final customers or to distributors. Operation of transmission includes as well the tasks of system operation concerning its management of energy flows, reliability of the system and availability of all necessary system services". (definition taken from the ENTSO-E RGCE Operation handbook Glossary). NOTE Additional obligations may be imposed through local market rules.		

IEC document	Actor / Role	Actor / Role description	Subactor	Subactor / Subrole description
IEC 62325-451-3, IEC 62325-451-6	Transmission Capacity Allocator	Manages the allocation of transmission capacity for an Allocated Capacity Area. For explicit auctions: The Transmission Capacity Allocator manages, on behalf of the System Operators, the allocation of available transmission capacity for an Allocated Capacity Area. He offers the available transmission capacity to the market, allocates the available transmission capacity to individual Capacity Traders and calculates the billing amount of already allocated capacities to the Capacity Traders.		
IEC 62325-451-4, IEC 62325-103	Metered Data Aggregator	A party responsible for the establishment and qualification of metered data from the Metered Data Responsible. This data is aggregated according to a defined set of market rules.		
IEC 62325-451-3, IEC 62325-451-4	Balance Responsible Party	A party that has a contract proving financial security and identifying balance responsibility with the Imbalance Settlement Responsible of the Market Balance Area entitling the party to operate in the market. This is the only role allowing a party to nominate energy on a wholesale level. Additional information: The meaning of the word "balance" in this context signifies that the quantity contracted to provide or to consume shall be equal to the quantity really provided or consumed.	Trade Responsible Party	A party who can be brought to rights, legally and financially, for any imbalance between energy nominated and consumed for all associated Accounting Points. NOTE A power exchange without any privileged responsibilities acts as a Trade Responsible Party.

IEC document	Actor / Role	Actor / Role description	Subactor	Subactor / Subrole description
IEC 62325-451-2, IEC 62325-451-4, IEC 62325-451-6, IEC 62325-451-11	Data Provider	A party that has a mandate to provide information to other parties in the energy market. NOTE For example, due to Article 2 of the European Commission Regulation 543/2013 of the 14th of June 2013, a data provider may be a Transmission System Operator or a third party agreed by a TSO.	Transmission System Operator	According to the Article 2.4 of the Electricity Directive 2009/72/EC (Directive): "a natural or legal person responsible for operating, ensuring the maintenance of and, if necessary, developing the transmission system in a given area and, where applicable, its interconnections with other systems, and for ensuring the long-term ability of the system to meet reasonable demands for the transmission of electricity". Moreover, the TSO is responsible for connection of all grid users at the transmission level and connection of the DSOs within the TSO control area.
			MOL Responsible	Responsible for the management of the available tenders for all Acquiring System Operators to establish the order of the reserve capacity that can be activated.
IEC 62325-451-4, IEC 62325-103	Imbalance Settlement Responsible	A party that is responsible for settlement of the difference between the contracted quantities and the realised quantities of energy products for the Balance Responsible Parties in a Market Balance Area. NOTE The Imbalance Settlement Responsible has not the responsibility to invoice. The Imbalance Settlement Responsible may delegate the invoicing responsibility to a more generic role such as a Billing Agent.		
IEC 62325-451-4, IEC 62325-103	Billing Agent	The party responsible for invoicing a concerned party.		

IEC document	Actor / Role	Actor / Role description	Subactor	Subactor / Subrole description
IEC 62325-103, IEC 62325-451-6	Market Operator	The unique power exchange of trades for the actual delivery of energy that receives the bids from the Balance Responsible Parties that have a contract to bid. The Market Operator determines the market energy price for the Market Balance Area after applying technical constraints from the System Operator. It may also establish the price for the reconciliation within a Metering Grid Area.	Reconciliation Price Setter	
IEC 62325-103, IEC 62325-451-6	Party Connected to the Grid	A party that contracts for the right to consume or produce electricity at an Accounting Point	Consumer	A party that consumes electricity.
IEC 62325-451-3	Interconnection Trade Responsible	Is a Balance Responsible Party or depends on one. He is recognised by the Nomination Validator for the nomination of already allocated capacity.		
ROLES OUT OF THE ENTSO-E HARMONIZED ROLE MODEL				
IEC 62325-451-1	Originator	Generic role. Sender of the message.		
IEC 62325-451-1	Recipient	Generic role. Receiver of the message.		
IEC62325-451-5	Responsible Operator	Generic role that exchanges information with the Market Participant, i.e. System Operator, Transmission Capacity Allocator, Capacity Coordinator, etc.		
IEC 62325-451-6	Information Receiver	Generic role that receives data.		

IEC document	Actor / Role	Actor / Role description	Subactor	Subactor / Subrole description
IEC 62325-451-7	Resource Provider	May supply the reserves and provide the daily market schedules for consumption and generation.		
IEC 62325-451-7	Reserve Allocator	Informs the market of reserve requirements, receives tenders against the requirements, determines what tenders meet requirements and assigns the tenders.		
IEC 62325-451-10	Metered Data User	Metered Data User that is authorized to acquire Energy Usage Information from the Metering Data Manager		
IEC 62325-451-10	Metered Data Manager	The Metering Data Manager is a Macro-Role, including: Metered Data Aggregator, Metered Data Responsible, Metering Point Administrator, Other Metered Data User Relationship Manager (Respond to regulatory changes and expand the range of Smart-related services offered to actors of the Electric Power System (not Grid Users/ Suppliers/BRPs). The possibility to provide regulated services based on data management and provision in order to facilitate national en local public policies and enable customer empowerment.)	Metered Data Aggregator, Metered Data Responsible, Metering Point Administrator, Other Metered Data User Relationship Manager	See above
IEC62325-451-11	(C)DSO	Similar to TSOs, (C)DSOs also own and/or operate elements in the distribution grid, while at the same time are responsible of the security of supply within their area of interest and action.		

IEC document	Actor / Role	Actor / Role description	Subactor	Subactor / Subrole description
IEC 62325-451-11	Regional Security Coordinator	The regional security coordinator is performing tasks related to TSOs regional coordination, within a capacity calculation region.		
IEC 62325-451-11	Outage Planning Agent	The outage planning agent is the entity responsible for planning the availability status of a relevant power generating module, a relevant demand facility or a relevant grid element		
IEC 62325-451-11	NRAs	National regulatory authority is a national regulatory authority designated in accordance with Article 35(1) of Directive 2009/72/EC of the European Parliament and of the Council of 13 July 2009 concerning common rules for the internal market in electricity.		
IEC 62325-451-11	Facility Owners	The facility owners are the ones who own the power generating and demand facilities, which are some of the key elements of the power grid.		
IEC 62325-103	Accountable	Generalizes Reconciliation Accountable	Reconciliation Accountable	A party that is financially accountable for the reconciled volume of energy products for a profiled Accounting Point.
IEC 62325-103	Transport Capacity Responsible Party			

IEC document	Actor / Role	Actor / Role description	Subactor	Subactor / Subrole description
IEC 62325-103	Transport Responsible Party			
IEC 62325-103	Settlement Responsible	Generalizes Imbalance Settlement Responsible	Imbalance Settlement Responsible	A party that is responsible for settlement of the difference between the contracted quantities and the realised quantities of energy products for the Balance Responsible Parties in a Market Balance Area. NOTE The Imbalance Settlement Responsible has not the responsibility to invoice. The Imbalance Settlement Responsible may delegate the invoicing responsibility to a more generic role such as a Billing Agent.
IEC 62325-103	Collector	Generalizes Metered Data Collector	Metered Data Collector	A party responsible for meter reading and quality control of the reading.
IEC 62325-103	Aggregator	Generalizes Metered Data Aggregator	Metered Data Aggregator	A party responsible for the establishment and qualification of metered data from the Metered Data Responsible. This data is aggregated according to a defined set of market rules.
IEC 62325-103	Validator	Generalizes Metered Data Responsible	Metered Data Responsible	A party responsible for the establishment and validation of metered data based on the collected data received from the Metered Data Collector. The party is responsible for the history of metered data for a Metering Point.

IEC document	Actor / Role	Actor / Role description	Subactor	Subactor / Subrole description
IEC 62325-103	Initiating Role	Generalizes Metering Point Administrator	Metering Point Administrator	A party responsible for registering the parties linked to the metering points in a Metering Grid Area. The party is also responsible for registering and making available the Metering Point characteristics.
IEC 62325-103	Party Administrator			
IEC 62325-103	Administrator			
IEC 62325-103	Reconciliatory	Generalizes Reconciliation Responsible	Reconciliation Responsible	A party that is responsible for reconciling, within a Metering Grid Area, the volumes used in the imbalance settlement process for profiled Accounting Points and the actual metered quantities. NOTE The Reconciliation Responsible may delegate the invoicing responsibility to a more generic role such as a Billing Agent.
IEC 62325-103	Supplier	Generalizes Balance Supplier	Balance Supplier	A party that markets the difference between actual metered energy consumption and the energy bought with firm energy contracts by the Party Connected to the Grid. In addition, the Balance Supplier markets any difference with the firm energy contract (of the Party Connected to the Grid) and the metered production. Additional information: There is only one Balance Supplier for each Accounting Point.

IEC document	Actor / Role	Actor / Role description	Subactor	Subactor / Subrole description
IEC 62325-103	Grid Company	Generalizes Grid Access Provider	Grid Access Provider	A party responsible for providing access to the grid through a Metering Point for energy consumption or production to the Party Connected to the Grid. The party is also responsible for creating and terminating Metering Points.
IEC 62325-103	Calorific Value Calculator	Generalizes Calorific Value Responsible	Calorific Value Responsible	
IEC 62325-103	Certificate Issuer			

10 Use cases and roles of TC 57 WG 17, *Power system intelligent electronic device communication and associated data models for distributed energy resources and distribution automation*

10.1 General

The scope of WG 17, *Power system intelligent electronic device communication and associated data models for distributed energy resources and distribution automation*, is to extend the IEC 61850 object models and services required for information exchanges, covering:

- Distributed energy resources (DER), comprising generation, load and storage;
- Distribution feeder and network equipment, to support automation of power distribution systems;
- Management systems required for their operation and integration with electric power systems.

10.2 Documents used

IEC reference	Name	Publication status	Edition
61850-7-420	Basic communication structure – Distributed energy resources – Logical nodes	PCC	2
61850-8-2	Specific communication service mapping (SCSM) – Mapping to Extensible Messaging Presence Protocol (XMPP)	BPUB	1
61850-90-8	Object models for electrical mobility	Published	1
61850-90-9	Use of IEC 61850 for electrical storage systems	PWI	1
61850-90-15	Hierarchical architecture of a DER system	PWI	1

10.3 TC 57 WG 17 Use Case reporting

WG number of identified Use Cases	% of Use Cases described with 62559-2	% of Business Use Cases	% of System Use Cases	Number of roles identified			% of non-defined roles
38	0 %	0 %	100 %	21	14,29 %	85,71 %	14,3 %

10.4 TC 57 WG 17 List of Use Case per normative document

IEC document	Use Case title	Status	Description	Actors / Roles	IEC 62559-2 compliance
61850-7-420	***Basic communication structure – Distributed energy resources – logical nodes***	***PCC***			
61850-7-420	Control and supervision of distributed energy resources	PCC	Implied		
61850-7-420	Control and supervision of distributed energy resources – photovoltaic	PCC	Implied		
61850-7-420	Control and supervision of distributed energy resources – combined heat and power	PCC	Implied		
61850-8-2	***Specific communication service mapping (SCSM) – Mapping to Extensible Messaging Presence Protocol (XMPP)***	***BPUB***			
61850-8-2	Deployment of XMPP within one XMPP domain – Facility	BPUB	The facility domain can be deployed using an XMPP communication environment. The facility domain is responsible for maintaining the XMPP server; the XMPP server can be located in a LAN or within a WAN depending on the communication network implementation.	XMPP Server, DER Management System, DER System	

IEC document	Use Case title	Status	Description	Actors / Roles	IEC 62559-2 compliance
61850-8-2	Deployment of XMPP within one XMPP domain – Hierarchy within a facility	BPUB	The Use Cases shows the hierarchical aggregation of DERs.	Control Centre, DER Management System, XMPP Server, DER System	
61850-8-2	Interconnexion of XMPP Domain – Facility at DSO	BPUB	Connection of the facility to the DSO	Control Centre, DER Management System, XMPP Server, DER System	
61850-8-2	Interconnexion of XMPP Domain – Multiple Facilities at DSO	BPUB	Any hierarchical aggregation is possible	Control Centre, DER Management System, XMPP Server, DER System	
61850-8-2	Interconnexion of XMPP Domain – VPP Communications	BPUB	The domains involved in the Use Case are: – DSO.org – the domain of a DSO. – VPP.net – the domain of the virtual power plan having contracts with resources. The Control Centre of the DSO is being deployed with as many domain specific JIDs as domains it needs to interact with. The Control Centre of the VPP is being deployed with as many domain specific JIDs as domains it needs to interact with.	Control Centre, DER Management System, XMPP Server, DER System	

IEC document	Use Case title	Status	Description	Actors / Roles	IEC 62559-2 compliance
61850-8-2	Interconnexion of XMPP Domain – VPP Communication to DERs@VPP	BPUB	The Use Case illustrates the communication logical paths involved when the VPP Control Centre communicates with VPP.net DERs.	Control Centre, DER Management System, XMPP Server, DER System	
61850-8-2	Interconnexion of XMPP Domain – VPP Communication to DERs@DSO	BPUB	The Use Case illustrates the communication logical paths involved when the VPP Control Centre communicates with DSO.org members	Control Centre, DER Management System, XMPP Server, DER System	
61850-8-2	Interconnexion of XMPP Domain – DSO Communication to DERs@VPP	BPUB	The Use Case illustrates the communication logical paths involved when the Control Centre of DSO communicates with VPP.net members	Control Centre, DER Management System, XMPP Server, DER System	
61850-8-2	Interconnexion of XMPP Domain – DSO Communication to DERs@DSO	BPUBS	The Use Case illustrates the communication logical paths involved when the DSO Control Centre communicates with DSO.org DERs	Control Centre, DER Management System, XMPP Server, DER System	
61850-8-2	Interconnexion of Domain with federation – Facility at DSO	BPUB	The Use Case illustrates the use of federation in the multi-domain communication DSO.org – facility.org.	Control Centre, DER Management System, XMPP Server, DER System	

IEC document	Use Case title	Status	Description	Actors / Roles	IEC 62559-2 compliance
61850-8-2	Interconnexion of Domain with federation – VPP Communications	BPUB	The Use Case illustrates the second set of VPP communication using federation with the DSO	Control Centre, DER Management System, XMPP Server, DER System	
61850-8-2	Interconnexion of Domain with federation – VPP Communication to DERs@VPP	BPUB	The Use Case illustrates the logical paths between the VPP Control Centre and the DERs belonging to the same domain.	Control Centre, DER Management System, XMPP Server, DER System	
61850-8-2	Interconnexion of Domain with federation – VPP Communication to DERs@DSO	BPUB	Communication between management@VPP.com and DER@DSO.org will transit over federation between the domain servers VPP.com and DSO.org.	Control Centre, DER Management System, XMPP Server, DER System	
61850-8-2	Interconnexion of Domain with federation – DSO Communication to DERs@VPP	BPUB	Communication between management@DSO.org and DER@VPP.com will transit over federation between the domain servers VPP.com and DSO.org	Control Centre, DER Management System, XMPP Server, DER System	
61850-90-8	***Object models for electrical mobility***	***PWI***			
61850-90-8	Certificate Update	PWI			
61850-90-8	Certificate Installation	PWI			
61850-90-8	Authentication from EV with Authorization from secondary actors	PWI			

IEC document	Use Case title	Status	Description	Actors / Roles	IEC 62559-2 compliance
61850-90-8	Identification at the EVSE with validation from the secondary actor	PWI			
61850-90-8	Optimized charging with scheduling from the secondary actor	PWI	This Use Case covers the AC charging process with information about local installation, grid schedule and sales tariff table. With this, the EVSE can dynamically react to changes in the supply chain to reduce peak demand or oversupply situations. Additionally, the behaviour of the vehicle while charging becomes transparent to secondary actors in order to enhance electricity supply scheduling. The secondary actor needs to propose a charging schedule to the SECC, based on actual information about the local installation (e.g. power limits, local power generation), grid schedule and sales tariff table. It is necessary that EVCC, SECC and secondary actor have each the possibility to trigger a re-scheduling of the charging schedule.	EV, EVCC, EVSE, SECC, DCH, E-Mobility Operator	

IEC document	Use Case title	Status	Description	Actors / Roles	IEC 62559-2 compliance
61850-90-8	Optimized charging with scheduling at EV	PWI	This Use Case covers the AC charging process with information about local installation, grid schedule and sales tariff table. With this the EV can react on changes in the supply chain to reduce peak demand or oversupply situations. Additionally the behaviour of the vehicle while charging becomes transparent to secondary actors in order to enhance electricity supply scheduling. The secondary actor needs to propose a charging schedule to the SECC, based on actual information about the local installation (e.g. power limits, local power generation), grid schedule and sales tariff table. It is necessary that the EVCC, SECC and secondary actor each have the possibility to trigger a re-scheduling of the charging schedule.	EV, EVCC, EVSE, SECC, DCH, E-Mobility Operator	
61850-90-8	Reactive Power Compensation	PWI			
61850-90-8	Vehicle to Grid Support	PWI			
61850-90-8	Value-added Services	PWI			
61850-90-8	Charging Details	PWI			

IEC document	Use Case title	Status	Description	Actors / Roles	IEC 62559-2 compliance
61850-90-9	***Use of IEC 61850 for electrical storage systems***	***PWI***			
61850-90-9	Interactions between DER MS and EESS Device/Unit	PWI	Overview	DER MS FDEMS (Facility DER Management System), Electric Energy Storage System (EESS), Electrical Energy Storage Device/Unit	
61850-90-9	Interactions between DER MS and EESS Device/Unit – Retrieve current status and capabilities of EESS	PWI	The DER management system retrieves the current electrical capabilities from the storage system	DER MS FDEMS (Facility DER Management System), Electric Energy Storage System (EESS), Electrical Energy Storage Device/Unit	
61850-90-9	Interactions between DER MS and EESS Device/Unit – Set charging Power to EESS	PWI	DER management system is setting the charging power to the (battery) storage EESS	DER MS FDEMS (Facility DER Management System), Electric Energy Storage System (EESS), Electrical Energy Storage Device/Unit	

IEC document	Use Case title	Status	Description	Actors / Roles	IEC 62559-2 compliance
61850-90-9	Interactions between DER MS and EESS Device/Unit – Set discharging Power to EESS	PWI	DER management system is setting the discharging power to be supplied by the EESS	DER MS FDEMS (Facility DER Management System), Electric Energy Storage System (EESS), Electrical Energy Storage Device/Unit	
61850-90-9	Interactions between DER MS and EESS Device/Unit – Set Operational function/schedule to EESS	PWI	DER management system is setting a specific operational function/schedule on the EESS	DER MS FDEMS (Facility DER Management System), Electric Energy Storage System (EESS), Electrical Energy Storage Device/Unit	
61850-90-9	Interactions between DER MS and EESS Device/Unit – EESS Alarm / Asset Monitoring	PWI	DER management system receives status of alarms from EESS.	DER MS FDEMS (Facility DER Management System), Electric Energy Storage System (EESS), Electrical Energy Storage Device/Unit	

IEC document	Use Case title	Status	Description	Actors / Roles	IEC 62559-2 compliance
61850-90-15	***Hierarchical architecture of a DER system***	***PWI***			
61850-90-15	Emergency active power direct control	PWI	In case of emergency situations (red TL phase) the system operator switches-off individual or groups of DER systems completely or changes their in-feed power	Congestion management, DDEMS, DER Management System (DERMS), DER System, DER Unit (Controller), Network State Estimation Application, Power Flow Application, SCADA of DMS, System Operator	

IEC document	Use Case title	Status	Description	Actors / Roles	IEC 62559-2 compliance
61850-90-15	Re-dispatching	PWI	DSO/TSO has to manage the electrical network in a secure and reliable mode to transmit/distribute the generated energy. In all situations the balance of generation and consumption of energy as to be fulfilled. In case of congestions of the energy flow through the network TSO/DSO has to take measures to avoid/solve these network congestions. Therefore responsible TSO/DSO calculates new schedules for the generating units in its area and sends these to the involved power stations or DER systems. Measures can be divided into prevent (ex ante) or to solve (ex post) network congestions. Re-dispatching is not market driven action.	Congestion management, DDEMS, DER Management System (DERMS), DER System, DER Unit (Controller), Network State Estimation Application, Power Flow Application, SCADA of DMS, System Operator	
61850-90-15	Active power scheduling of DER	PWI	DER Systems participates in the energy market of a balancing area by its supply of active power. Therefore they trade with schedule-based offers by its connected DER MS on energy market. After they get the order they have to provide the energy based on contracted schedules. The schedules have to be exchanged to the DER Systems in preparation to the contracted time period (e.g. for the next day, next week etc.).	DDEMS, DER Management System (DERMS), DER System, SCADA of DMS, System Operator	

IEC document	Use Case title	Status	Description	Actors / Roles	IEC 62559-2 compliance
61850-90-15	Registration and Administration of DER MS of DER Systems at DSO	PWI	All DER Systems has to be registered at their connected ESP to get the rights to connected by ECP. An administration system allows managing DER systems to be prepared in emergency situations.	DDEMS, DER Management System (DERMS), DER System, SCADA of DMS, System Operator	
61850-90-15	Frequency Control – Primary Control (PC)	PWI	According to the German BDEW's traffic light concept the utilization of contracted balancing power for PC happens in the green phase. If the utilization of balancing power is not enough, the transmission system operator shall – in the amber traffic light phase – draw upon contracted flexibility which is offered voluntarily on the market.	Transmission System Operator, DER System	
61850-90-15	Frequency Control – Secondary Control (PC)	PWI	According to the German BDEW's traffic light concept the utilization of contracted balancing power for SC happens in the green phase. If the utilization of balancing power is not enough, the transmission system operator shall – in the amber traffic light phase – draw upon contracted flexibility which is offered voluntarily on the market.	Transmission System Operator, DER System	

IEC document	Use Case title	Status	Description	Actors / Roles	IEC 62559-2 compliance
61850-90-15	Frequency Control – Tertiary Control (PC) / Minutes Reserve	PWI	According to the German BDEW's traffic light concept the utilization of contracted balancing power for TC happens in the green phase. If the utilization of balancing power is not enough, the transmission system operator shall – in the amber traffic light phase – draw upon contracted flexibility which is offered voluntarily on the market.	Transmission System Operator, DER System	

10.5 TC 57 WG 17 list of roles used

IEC document	Actor/Role	Description
BUSINESS ROLES		
61850-90-8	E-Mobility Operator	
61850-90-15	System Operator	The Systems Operator (Transmission / Distribution) is responsible for the secure and reliable operation of the EPS.
61850-90-15	Transmission System Operator (TSO)	The TSO operates supra-regional transmission systems for power supply. He plans, builds and maintains the transmission system infrastructure and is responsible for the overall power system stability, load balancing in control areas, connections between control areas and connections of the distribution systems within his control area.
SYSTEM ROLES		
61850-90-15	Congestion management	Application at System Operator level. Calculates future and current congestions and computes how to avoid/solve these congestions.
61850-8-2	Control Centre	
61850-90-15	DDEMS	DER MS of DSO
61850-90-8	Demand Clearing House (DCH)	Entity for grid negotiation that provides information on the load of the grid
61850-90-15	DER Management System (DERMS)	Manages one or more DER Systems.
61850-90-9	DER MS FDEMS (Facility DER Management System)	The system that is owned by the TSO/DSO or Facility Operator, interacting with EESS by sending operating commands and receiving current status of EESS. DER MS may interact with multiple EESS.
61850-90-15	DER System	A DER system is built up of an arbitrary number of DER units and/or underlying DER sub-systems, which are electrically connected together. A DER System is connected through one-to-many ECP/PCC to an electrical network
61850-90-15	DER Unit (Controller)	Physical System for Generation, Storage and Consumption of Energy. The DER Unit Controller controls and monitors the corresponding DER unit.

IEC document	Actor/Role	Description
61850-90-9	Electric Energy Storage System (EESS)	The electrical energy storage system that are composed of one or a plurality of energy storage devices and the controller. Each storage device is capable of absorbing (charging), providing (discharging) and storing energy.
61850-90-8	Electric Vehicle (EV)	Any vehicle propelled by an electric motor drawing current from a rechargeable storage battery or from other portable energy storage devices (rechargeable, using energy from a source off the vehicle such as a residential or public electric service), which is manufactured primarily for use on public streets, roads or highways.
61850-90-8	Electric Vehicle Communication Controller (EVCC)	Embedded system, within the vehicle, that implements the communication between the vehicle and the SECC in order to support specific functions
61850-90-8	Electric Vehicle Supply Equipment (EVSE)	Conductors, including the phase(s), neutral and protective earth conductors, the EV couplers, attached plugs, and all other accessories, devices, power outlets or apparatuses installed specifically for the purpose of delivering energy from the premises wiring to the EV and allowing communication between them as necessary.
61850-90-9	Electrical Energy Storage Device/Unit	The device/unit that actually stores and release energy according to the remote control commands from the DER MS or unit controller.
61850-90-15	Network State Estimation Application	Application of System operator level. Estimates network states on the basis of information of different sources
61850-90-15	Power Flow Application	Application of System operator level. Calculates the flow of energy through the electrical network depending on state estimation and real-time data
61850-90-15	SCADA of DMS	Supervision, Control and Data Acquisition
61850-90-8	Supply Equipment Communication Controller (SECC)	Entity which implements the communication to one or multiple EVCCs according to ISO 15118-2 and which may be able to interact with secondary actors.
61850-8-2	XMPP Server	

11 Use cases and roles of TC 57 WG 18, *Hydroelectric power plants – Communication for monitoring and control*

11.1 General

The scope of WG 18, *Hydroelectric power plants – Communication for monitoring and control*, is to develop communication standards for power plants – by defining additional structures and components for IEC 61850 models, to allow the use of this standard in hydropower, larger steam and gas turbine production plants.

11.2 Documents used

IEC reference	Name	Publication status	Edition
61850-7-410	Basic communication structure – Hydroelectric power plants – Communication for monitoring and control	Published	2
61850-7-510	Basic communication structure - Hydroelectric power plants – Modelling concepts and guidelines	Published	1

11.3 TC 57 WG 18 Use Case reporting

WG number of identified Use Cases	% of Use Cases described with 62559-2	% of Business Use Cases	% of System Use Cases	Number of roles identified
6	0 %	0 %	100 %	0

11.4 TC 57 WG 18 List of Use Case per normative document

IEC document	Use Case title	Pub. status	Description	Actors / Roles	IEC 62559-2 compliance
61850-7-410	***Hydroelectric power plants – Communication for monitoring and control***	***Published***	***Functions are described in more details in 61850-7-510***		
61850-7-410	Water control in a river system	Published	Process description Logical node HWCL shall be used to represent the control of one physical device, dam gate or turbine, which can modify the water flow through the plant. Compare also with the LN for joint control (HJCL) that can be used for combined control.		
61850-7-410	Electrical control of a hydroelectric power plant	Published	Process description		
61850-7-510	***Basic communication structure - Hydroelectric power plants – Modelling concepts and guidelines***	***Published***	***functions are described in details, but not modelled as Use Cases***		
61850-7-510	Generator excitation system	Published	For practical purposes, the excitation system will be divided in a number of Logical Devices that can be addressed and handled separately. The division into functional blocks (Regulation, Field breaker, Converter and Protection), as well as in Logical Devices (Avr, Afcr etc.) is only informative and may be interpreted in different ways.		

IEC document	Use Case title	Pub. status	Description	Actors / Roles	IEC 62559-2 compliance
61850-7-510	Turbine governor system	Published	The example is based on a minimum signal list on which everyone can agree, consisting of data points that are absolutely necessary for operating a turbine governor. In addition, consideration has been made to enable extension to other projects: • no fixed definition of used controllers, • clear separation of the control algorithm from the operation conditions and the data acquisition. The following assumptions have been made. • Francis turbine with one single actuator (only one position indication). In case of individual wicket gate control, individual position can be added and threshold associated to the actuators are being managed by internal data of the turbine governor; • single turbine governor (no redundant signal or system); • communication with a HMI (Human-Machine Interface) is not included.		
61850-7-510	Unit stop/start sequencer	Published	The examples are for a simple turbine generator unit with an intake gate and no inlet valve. The guide vanes are equipped with servomotor locks and the unit is supplied with a lubrification unit and brakes. The generator is cooled by a cooling fan. There are several different tripping strategies widely used as common practice today depending on a combination of different tripping criteria, different servomotor shutdown initiating devices and the corresponding sequence of tripping actions.		

IEC document	Use Case title	Pub. status	Description	Actors / Roles	IEC 62559-2 compliance
61850-7-510	Variable speed pumped storage	Published	Typical logical nodes of an excitation system for variable speed pumped storage system are mapped to the block diagrams. For practical purposes, the excitation system will be divided in a number of Logical Devices that can be addressed and handled separately.		

11.5 TC 57 WG 18 list of roles used

Document	Actor/Role	Description
None		

12 Use cases and roles of TC 57 WG 19, *Interoperability within TC 57 in the long term*

12.1 General

The scope of WG 19, *Interoperability within TC 57 in the long term*, is to address harmonization issues between the other TC 57 working groups and to chart a roadmap for future standards development in TC 57.

12.2 Documents used

IEC reference	Name	Publication status	Edition
62361-102	CIM – IEC 61850 harmonization	Published	1
60870-6-503	Telecontrol protocols compatible with ISO standards and ITU-T recommendations – TASE.2 Services and protocol	Published	3

12.3 TC 57 WG 19 Use Case reporting

WG number of identified Use Cases	% of Use Cases described with 62559-2	% of Business Use Cases	% of System Use Cases	Number of roles identified			% of non-defined roles
7	28,6 %	0 %	100 %	17	23,53 %	76,47 %	5,9 %

12.4 TC 57 WG 19 List of Use Case per normative document

IEC document	Use Case title	Pub. Status	Description	Actors / Roles	IEC 62559-2 compliant
62361-102	***CIM – IEC 61850 harmonization***	***Published***			
62361-102	SCADA/EMS/DMS configuration from 61850 SCL	Published	An engineer, using a System Configuration Tool (SCT), defines the primary equipment, single line connectivity, associations and IEDs for a local automation system. This information is used to create the SCD file that is used within IED Configuration tool(s) to configure the 61850 devices. This same SCD file can be used to provide information for the model used within CIM-based applications using IEC 61970 or IEC 61968	Planning Department (Substation Engineering), CIM Modeling Engineer, CIM/EMS Modeling tools, SCADA/EMS/DMS, 61850 [Automation] System Engineer, Substation Configuration Tool (SCT), IED Vendor, IED Tool, IED	X
62361-102	Volt-Var Control using CIM and 61850	Published	This Use Case builds on the configuration and real time data Use Cases. Coordinated volt-var control requires that the control centre has a consistent view of not only the network equipment and its measurements as described in the configuration Use Case, but also appropriate information about the equipment parameters, the remote control capabilities and settings used by local automation. This Use Case was considered relevant but was not examined in detail due to time constraints. The particular issues for volt-var control including the modelling of distributed energy resources (DER) will be addressed in detail in a future document.	-	

IEC document	Use Case title	Pub. Status	Description	Actors / Roles	IEC 62559-2 compliant
62361-102	System integrity protection schemes (SIPS) using CIM and 61850	Planned	Currently not in the scope of the document		
62361-102	SCADA commissioning	Published	The final step of the SCADA/EMS/DMS commissioning Use Case is "Perform Test and Validation to turn on SCADA and receive IEC6 1850 data, and execute commands". This can also be considered as part of the SCADA Commissioning Use Case. The CIM update information will be incorporated into the online SCADA and the new measurements and controls commissioned. Bi-directional real time end-to-end data transfer between IEDs and the control centre can then take place.	Control centre, IED	
62361-102	Wide Area Monitoring, Protection and Control system (WAMPAC) for Transient stability	Published	An engineer designs control centre (C/C) and substation (S/S) information model using CIM and IEC61850 respectively, and then defines information exchanged between C/C and S/S as boundary data set. Next an engineer harmonizes CIM objects and IEC61850 objects in the boundary data set. WAMPAC system monitors, protects and controls power system using boundary data set mapping in real-time.	System Engineer, CE (Central Equipment), PDC (Phasor Data Condensator), PMU (Phasor Measurement Unit), IED, Power System	X
60870-6-503	1. Determining what Measurement/MeasurementValues are available	Published			

IEC document	Use Case title	Pub. Status	Description	Actors / Roles	IEC 62559-2 compliant
	1a. Determining information associated to equipment	Published	In this case, the initiating utility (Utility A) needs to be able to determine which TASE.2 bilateral items of Utility B related to Equipment information previously supplied by Utility B, and merged into Utility A's model.	Utilities	
	1b. Determining Measurement information for non-equipment related measurements	Published	This Use Case starts out very similar to Use Case 1A, but Utility B's information exchange can include "free-standing" Measurement/MeasurementValue pairs as in some cases there is need to exchange TASE.2 realtime information that is not associated into the Equipment model.	Utilities	
60870-6-503	2. Exchange of Bilateral Table information	Published	There is now a need of both sides to be able to provide the TASE.2 Bilateral Table information to each other.	Utilities	

12.5 TC 57 WG 19 list of roles used

IEC document	Actor / Role	Description
BUSINESS ROLES		
62361-102	CIM Modeling Engineer	Supports the SCADA and EMS systems. Does all data modeling using the modeling tools within the SCADA/EMS/DMS system.
62361-102	IED Vendor	Vendor of IEDs and/or IED Tools that are or might be potential solution providers
62361-102	61850 [Automation] System Engineer	Configures and supports the 61850 automation systems.
62361-102	System Engineer	Designs and installs boundary dataset mapping into the PDC(s)
SYSTEM ROLES		
62361-102	Planning Department (Substation Engineering)	Designs and/or specifies the substation, primary equipment and functional requirements.
62361-102	CIM/EMS Modeling tools	Sub-system of a SCADA/EMS/DMS used to create and update the model
62361-102	SCADA/EMS/DMS	A system that provides for monitoring, control, reporting and analysis of transmission or distribution networks
62361-102	Substation Configuration Tool (SCT)	A tool for configuring automation systems. This includes describing the system/substation equipment, connectivity model, IED devices and the local communications.
62361-102	IED Tool	Vendor and/or product specific application for the configuration or integration of IEDs
62361-102	IED	Any device incorporating one or more processors with the capability of receiving or sending data/control from or to an external source (for example, electronic multifunction meters, digital relays, controllers)
62361-102	Control centre	Communicates with field IEDs directly or via proxy/gateways
62361-102	CE (Central Equipment)	The CE undertakes state estimation using the data transmitted by PMUs via PDC(s). The CE determines control scenarios in the event that an instability phenomenon occurs and transmits them to IED(s).

IEC document	Actor / Role	Description
62361-102	PDC (Phasor Data Concentrator)	The PDC is a gateway between C/C and S/S. The PDC aggregates PMUs data and transmits to the CE. When the PUC receives control scenario from CE, the PDC transmits it to corresponding IED(s).
62361-102	PMU (Phasor Measurement Unit)	PMUs monitor the voltage & current data and the status of the power system. The PMUs transmit the above data to the CE via the PDC(s) and the IED(s).
62361-102	IED (Intelligent Electric Device)	The IED(s) output the tripping signal(s) to the load(s), generator(s) and/or control command(s) to generator excitation control system(s) in accordance with the data collected and the control scenario.
62361-102	Power System	Target power system to be monitored and controlled. Power system .consists of CT, VT, CB, Busbar, power transformer, transmission line, generator, load and so on.
60870-6-503	Utility	

13 Use cases and roles of TC 57 WG 21, *Interfaces and protocol profiles relevant to systems connected to the electrical grid*

13.1 General

The scope of WG21, *Interfaces and protocol profiles relevant to systems connected to the electrical grid*, is to define interface between the smart grid and residential and commercial building and industrial energy management systems and identify Use Cases which involve systems connected to the electrical grid. The focus is on interaction between power system management (TC 57 standards) and H/B/I energy management systems.

13.2 Documents used

IEC reference	Name	Publication status	Edition
62746-2	Use cases and requirements	Published	1

13.3 TC 57 WG21 Use Case reporting

WG number of identified Use Cases	% of Use Cases described with 62559-2	% of Business Use Cases	% of System Use Cases	Number of roles identified	% of Business Roles	% of System Roles	% of non-defined roles
55	100 %	1,8 %	98,2 %	23	21,74 %	78,26 %	0 %

13.4 TC 57 WG 21 List of Use Case per normative document

IEC document	Use Case title	Pub. status	Description	Actors / Roles	Subactors / Subroles	IEC 62559-2 compliance
62746	***System interface between customer energy management system and the power management system***					
62746-2	***Use Cases and Requirements***					
62746-2	JWG 1100-HLUC – SD consumes / generates energy on a flexible basis (High Level Use Case or Generic Use Case)	Published	The User activates a specific profile on the Smart Device that allows a flexible start. The Smart Device then starts a negotiation process with the CEM to find the most suitable start time. The interaction between the SD and the CEM does not require user interaction and operates autonomously. The SD fulfils the job according to the activated profile and might ask the user for final confirmation. After job completion the end customer might get notified on successful or failed commissioning. A Smart Device might have two basic operational modes: – Power Consumption by using electricity – Power Producing by generating electricity	Customer Energy Manager		X
				Smart device		
				Smart appliance (white goods)		
				Actor A		
				Actor B		
				User		