



BSI Standards Publication

Communication networks and systems for power utility automation

Part 90-9: Use of IEC 61850 for Electrical Energy Storage Systems

National foreword

This Published Document is the UK implementation of IEC TR 61850-90-9:2020.

The UK participation in its preparation was entrusted to Technical Committee PEL/57, Power systems management and associated information exchange.

A list of organizations represented on this committee can be obtained on request to its committee manager.

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Published by BSI Standards Limited 2020

ISBN 978 0 539 15600 3

ICS 33.200

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This Published Document was published under the authority of the Standards Policy and Strategy Committee on 31 October 2020.

Amendments/corrigenda issued since publication

Date	Text affected
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IEC TR 61850-90-9

Edition 1.0 2020-09

TECHNICAL REPORT



Communication networks and systems for power utility automation – Part 90-9: Use of IEC 61850 for Electrical Energy Storage Systems

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

ICS 33.200

ISBN 978-2-8322-8865-8

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CONTENTS

FOREWORD.....	6
INTRODUCTION.....	8
1 Scope.....	10
1.1 Scope of this document.....	10
1.2 Namespace.....	10
1.3 Data model Namespace Code Component distribution.....	10
2 Normative references.....	11
3 Terms, definitions and abbreviated terms.....	12
3.1 Terms and definitions.....	12
3.2 Abbreviated terms.....	14
3.3 Acronyms and abbreviated terms proposed specifically for the data model part of this document.....	14
3.4 Common abbreviated terms used for the data model part of this document.....	15
4 Overview of EESS.....	34
4.1 EESS system description.....	34
4.2 Functional requirements of EESS.....	35
4.3 EESS participating in grid operations as a DER system.....	35
4.3.1 General.....	35
4.3.2 Constraints, assumptions, and design considerations.....	36
4.4 Hierarchical class model of DER resources.....	36
4.5 DER resource class and composition model for EESS.....	37
4.5.1 General.....	37
4.5.2 DER class model principles for a single storage unit.....	37
4.5.3 Expressing the composition of storage elements.....	39
4.5.4 Expressing equivalent capabilities.....	41
4.5.5 Complete DER model resulting from equivalent and composed principles.....	43
4.5.6 LN mapping example in case of a complex storage installation.....	45
4.6 State machine of the EESS.....	47
4.7 Definitions of the capacity and the state of charge of an EESS.....	49
5 Use cases.....	50
5.1 General.....	50
5.2 Use case overview.....	50
5.2.1 Diagram.....	50
5.2.2 Actors.....	51
5.2.3 List of use cases.....	51
5.2.4 Information flow (basic flow).....	52
5.2.5 Summary of exchanged information in use cases.....	57
6 IEC 61850 based information modelling.....	62
6.1 Logical Nodes from 61850-90-9 namespace.....	62
6.1.1 General.....	62
6.1.2 Abstract LNs related to the 61850-90-9 namespace (AbstractLN_90_9).....	66
6.1.3 Logical Nodes from Group D (LNGroupD_90_9).....	71
6.1.4 Logical Nodes from Group S (LNGroupS_90_9).....	78
6.2 Enumerations.....	81
6.2.1 General.....	81
6.2.2 Battery Test Results (BatteryTestResultKind).....	82

6.2.3	Type of Battery (BatteryTypeKind).....	82
6.2.4	Storage charging/discharging permissions (ChargeSourceKind)	83
Annex A (informative) Concrete case 1&2: YSCP (Yokohama Smart City Project) DER		
	MS (Battery SCADA) system use cases.....	84
A.1	System use cases #1: Online power system control with aggregated battery based EESS (virtual energy storage)	84
A.1.1	Descriptions of function	84
A.1.2	Step by step analysis of function	88
A.1.3	Auxiliary issues – Revision history	97
A.2	System use case #2 Active power schedule updating by using aggregated battery-based EESS.....	97
A.2.1	Descriptions of function	97
A.2.2	Step by step analysis of function	106
A.2.3	Auxiliary issues – Revision history	113
Annex B (informative) DER functions to meet EESS energy application requirements.....		
Annex C (informative) Energy service by electrical energy storage system use case #1 (Energy supply and demand adjustment using customer’s battery system)		
C.1	Use case description.....	118
C.1.1	Use case name.....	118
C.1.2	Use case scope and objectives.....	118
C.1.3	Use case detailed description	119
C.2	Use case diagrams	120
C.3	Technical details – Actors	123
C.4	Information exchanged.....	124
Bibliography.....		
125		
Figure 1 – Classification of electrical energy storage systems according to energy form. IEC-WP [IEC White Paper Electrical Energy Storage:2011])		
34		
Figure 2 – Different uses of electrical energy storage in grids, depending on the frequency and duration of use.....		
35		
Figure 3 – Simple storage resource model of a battery storage unit (instance & class)		
37		
Figure 4 – Hierarchical class model of DER resources – (blue outlined area showing EESS).....		
38		
Figure 5 – Exposing the generic interface of a DER unit (Case of a storage unit as an example).....		
39		
Figure 6 – DER composition model principles		
40		
Figure 7 – LN mapping related to a storage system composed of two storage units		
41		
Figure 8 – Needed association to express DER generic capabilities		
42		
Figure 9 – Exposing the generic interfaces of a storage DER (battery storage as example).....		
43		
Figure 10 – Principles of the hierarchical class model of DER resources with examples of specific DER types at the lowest level (blue outlined area showing EESS).....		
44		
Figure 11 – LN mapping of an EESS composed of 2 storage units with equivalent capabilities defined at all levels		
45		
Figure 12 – A simple electrical energy storage system.....		
46		
Figure 13 – A more complex electrical mixed system, including storage – example of possible LN mapping		
46		
Figure 14 – DER common state diagram.....		
48		
Figure 15 – Logic definitions associated to the DER common state diagram		
49		

Figure 16 – EESS state of charge: effective and usable capacities and states of charge reflected using the IEC 618650 model naming conventions 50

Figure 17 – Use case diagram 51

Figure 18 – The entire sequence of EESS use cases 52

Figure 19 – Sequence of UC1: retrieving current capabilities/status of EESS information to Storage Management System 53

Figure 20 – Sequence of UC2: set Charging power to EESS 55

Figure 21 – Sequence of UC3: Set discharging power to EESS 55

Figure 22 – Sequence of UC4: set operational function/schedule to EESS 56

Figure 23 – Sequence of UC5: Alarm/Asset Monitoring of EESS 57

Figure 24 – Class diagram LogicalNodes_90_9::StorageLNs_Global arrangement 62

Figure 25 – Class diagram LogicalNodes_90_9::StorageLNs_Details 63

Figure 26 – Class diagram LogicalNodes_90_9::StorageLNs_90_9_1 64

Figure 27 – Class diagram LogicalNodes_90_9::StorageLNs_90_9_2 65

Figure 28 – Class diagram DOEnums_90_9::DOEnums_90_9 82

Figure A.1 – Load Frequency control by battery aggregation 85

Figure A.2 – Actors 86

Figure A.3 – Calculation of the total surplus potential for the default plan 104

Figure A.4 – Calculation of the schedule of batteries for the default plan 104

Figure A.5 – Calculation of the schedule of batteries for the default plan 105

Figure A.6 – Calculation of the schedule of batteries for the plan 105

Table 1 – Tracking information of (Tr)IEC 61850-90-9:2018A namespace building-up 7

Table 2 – Attributes of (Tr)IEC 61850-90-9:2018A namespace 10

Table 3 – Generic acronyms and abbreviated terms 14

Table 4 – Normative abbreviations for data object names 15

Table 5 – Normative abbreviations for data object names 16

Table 6 – List of actors 51

Table 7 – List of use cases 52

Table 8 – Information exchange in UC1: Sequence of retrieving current capabilities/status of EESS information to Storage Management System 53

Table 9 – Information exchange Step1-2 in UC1 current capability /status information 54

Table 10 – Information exchange in UC2: Set Charging power to EESS 55

Table 11 – Information exchange in UC3: Set discharging power to EESS 56

Table 12 – Information exchange in UC4: set operational function to EESS 56

Table 13 – Information exchange in UC4: set schedule to EESS 57

Table 14 – Information exchange in UC5: Alarm/Asset Monitoring of EESS 57

Table 15 – Summary of exchanged Information in use cases with corresponding DOs/LNs 58

Table 16 – Data objects of Storage_Control_LN 66

Table 17 – Data objects of StorageOperationalSettingsLN 66

Table 18 – Data objects of StorageNameplateRatingsLN 68

Table 19 – Data objects of DER_StorageLN 70

Table 20 – Data objects of DBAT 71

Table 21 – Data objects of DSTO.....	74
Table 22 – Data objects of SBAT	78
Table 23 – Literals of BatteryTestResultKind	82
Table 24 – Literals of BatteryTypeKind	83
Table 25 – Literals of ChargeSourceKind.....	83

INTERNATIONAL ELECTROTECHNICAL COMMISSION

**COMMUNICATION NETWORKS AND SYSTEMS
FOR POWER UTILITY AUTOMATION –**

Part 90-9: Use of IEC 61850 for Electrical Energy Storage Systems

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 61850-90-9, 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:

Enquiry draft	Report on voting
57/2128/DTR	57/2184/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 61850 series, published under the general title *Communication networks and systems for power utility automation*, can be found on the IEC website. This IEC standard includes Code Components i.e. components that are intended to be directly processed by a computer.

Such content is any text found between the markers <CODE BEGINS> and <CODE ENDS>, or otherwise is clearly labelled in this standard as a Code Component.

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Table 1 shows all tracking information of (Tr)IEC 61850-90-9:2018A namespace building-up

Table 1 – Tracking information of (Tr)IEC 61850-90-9:2018A namespace building-up

Attribute	Content
Namespace IEC specific information	
Version of the UML model used for generating the document (informative)	WG17build6
Date of the UML model used for generating the document (informative)	2020-05-19
Autogeneration software name and version(informative)	j61850DocBuilder 01v03 based on jCleanCim 02v02-NS beta6

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.

IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

INTRODUCTION

IEC 61850 consists of the following parts, under the general title *Communication networks and systems for power utility automation* (all parts may have not been published yet).

- Part 1: Introduction and overview
- Part 2: Glossary
- Part 3: General requirements
- Part 4: System and project management
- Part 5: Communication requirements for functions and device models
- Part 6: Configuration description language for communication in electrical substations related to IEDs
- Part 7-1: Basic communication structure – Principles and models
- Part 7-2: Basic communication structure – Abstract communication service interface (ACSI)
- Part 7-3: Basic communication structure – Common data classes
- Part 7-4: Basic communication structure – Compatible logical node classes and data classes
- Part 7-410: Hydroelectric power plants – Communication for monitoring and control
- Part 7-420: Basic communication structure – Distributed energy resources logical nodes
- Part 8-1: Specific communication service mapping (SCSM) – Mappings to MMS (ISO 9506-1 and ISO 9506-2) and to ISO/IEC 8802-3
- Part 80-1: Guideline to exchange information from a CDC based data model using IEC 60870-5-101/104
- Part 9-2: Specific communication service mapping (SCSM) – Sampled values over ISO/IEC 8802-3
- Part 90-1: Use of IEC 61850 for the communication between substations
- Part 90-2: Using IEC 61850 for the communication between substations and control centres
- Part 90-3: Using IEC 61850 for condition monitoring
- Part 90-4: Network Engineering Guidelines – Technical report
- Part 90-5: Using IEC 61850 to transmit synchrophasor information according to IEEE C37.118
- Part 90-7: Object models for power converters in distributed energy resources (DER) systems
- Part 90-8: Object model for E-mobility
- Part 90-10: Object model for scheduling
- Part 10: Conformance testing

In addition to the above, the IEC 61850 basic communication structure for Wind Turbines has been published as IEC 61400-25, *Wind turbines – Communications for monitoring and control of wind power plants*.

This technical report is primarily based on the recommendation 5.7.4. “interface, control and standard data elements”, of the IEC white paper “Electrical Energy Storage” published in December 2011 by the MSB. The recommendation proposes the necessity of a standardization of interfaces between storage and other grid elements, protocols for data exchange and control rules, and data elements for input, output and control information supplied by or to storage systems. In Chapter 5 of the white paper “Large Capacity EESS”, EESS systems are expected to play an important role in integrating renewable energy by providing flexibility for the grid.

This document also describes the basic functions of Electric Energy Storage System (EESS) and the information model of the interface to integrate EESS in intelligent grids and establish the necessary communication with standardised data objects.

This document is connected with IEC 61850-7-420 Edition 21, as well as IEC 61850-7-4:2010 and IEC 61850-7-4/AMD1:2015, explaining how the control system and other functions in a battery based electric energy storage unit utilizes logical nodes and information exchange services within the IEC 61850 framework to specify the information exchanged between functions as well as information that individual functions need and generate. IEC 61850-7-420:2009 provides an information model for batteries which was derived from the proposed data objects of part 7-4. Those data objects (as well as the models proposed within IEC TR 61850-90-3) follow the requirements of batteries that are supposed to be used in substations as an auxiliary power system and as backup power supplies. For this purpose, it was enough to only model the discharge function. Therefore, it is necessary to prepare new logical nodes to be applicable for grid connected electrical energy storage systems, i.e. the scope of this technical report.

This document provides necessary information within the IEC 61850 based object model in order to model functions of a battery based electrical energy storage system as a DER unit. For intelligently operated and/or automated grids, storing energy for optimising the grid operation is a core function. Therefore, shorter periods of storing energy with charging and discharging capability are also an indispensable function. Charging and discharging operations need to be modelled thoroughly and are in the focus of this technical report.

Once agreed, the content of this report is intended to be merged within a new edition of IEC 61850-7-420. In order to facilitate such merge, this document already mentions by anticipation some elements extracted from a forthcoming second edition of IEC 61850-7-420, and which appear to be key to guarantee the consistency between the future DER model proposed in the forthcoming second edition of IEC 61850-7-420 and the detailed electrical energy storage system model, presented in this document.

These elements are specifically tagged as “referring to the forthcoming second edition of IEC 61850-7-420” and should be updated as soon as this new edition is officially published.

This document has also been worked upon in order to be as close as possible to the forthcoming IEC 62933 series².

¹ Under preparation. Stage at the time of publication: IEC/PRVC 61850-7-420:2020.

² Under consideration.

COMMUNICATION NETWORKS AND SYSTEMS FOR POWER UTILITY AUTOMATION –

Part 90-9: Use of IEC 61850 for Electrical Energy Storage Systems

1 Scope

1.1 Scope of this document

This technical report, which is part of the IEC 61850 series, describes the IEC 61850 information model for electrical energy storage systems (EESS). Therefore, this document only focuses on storage functionality in the purpose of grid integration of such systems at the DER unit level. Higher level Interactions are already covered in IEC 61850-7-420.

1.2 Namespace

This new subclause is mandatory for any IEC 61850 namespace (as defined by IEC 61850-7-1/AMD1).

Table 2 shows all attributes of (Tr)IEC 61850-90-9:2018A namespace.

Table 2 – Attributes of (Tr)IEC 61850-90-9:2018A namespace

Attribute	Content
Namespace nameplate	
Namespace Identifier	(Tr)IEC 61850-90-9
Version	2018
Revision	A
Release	3
Full Namespace Name	(Tr)IEC 61850-90-9:2018A
Namespace Type	transitional
Namespace dependencies	
Extends	IEC 61850-7-420:2019A version :2019 revision :A
Namespace transitional status	
Future handling of namespace content	The name space (Tr)IEC 61850-90-9:2018A is considered as "transitional" since the models are expected to be included in further editions IEC 61850-7-4xx. Potential extensions/modifications may happen if/when the models are moved to the International Standard status

1.3 Data model Namespace Code Component distribution

The Code Components are in light and full version:

- The full version is named: *IEC_TR_61850-90-9.NSD.2018A.Full*. It contains definition of the whole data model defined in this standard with the documentation associated and access is restricted to purchaser of this part.
- The light version is named: *IEC_TR_61850-90-9.NSD.2018A.Light*. It does not contain any documentations but contains the whole data model as per full version, and this light version is freely accessible on the IEC website for download at: <http://www.iec.ch/tc57/supportdocuments>, but the usage remains under the licensing conditions.