Communication networks and systems for power utility automation - Part 7-420: Basic communication structure - Distributed energy resources logical nodes

EESTI STANDARDIKESKUS
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NATIONAL FOREWORD

Käesolev Eesti standard EVS-EN 61850-7-420:2009 sisaldab Euroopa standardi EN 61850-7-420:2009 ingliskeelset teksti.	This Estonian standard EVS-EN 61850-7-420:2009 consists of the English text of the European standard EN 61850-7-420:2009.
Standard on kinnitatud Eesti Standardikeskuse 31.07.2009 käskkirjaga ja jõustub sellekohase teate avaldamisel EVS Teatajas.	This standard is ratified with the order of Estonian Centre for Standardisation dated 31.07.2009 and is endorsed with the notification published in the official bulletin of the Estonian national standardisation organisation.
Euroopa standardimisorganisatsioonide poolt rahvuslikele liikmetele Euroopa standardi teksti kättesaadavaks tegemise kuupäev on 11.06.2009.	Date of Availability of the European standard text 11.06.2009.
Standard on kättesaadav Eesti standardiorganisatsioonist.	The standard is available from Estonian standardisation organisation.

ICS 33.200

EUROPEAN STANDARD

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EN 61850-7-420

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Communication networks and systems for power utility automation - Part 7-420: Basic communication structure - Distributed energy resources logical nodes

(IEC 61850-7-420:2009)

Systèmes et réseaux de communication pour l'automatisation des services de distribution d'énergie - Partie 7-420: Structure de communication de base - Nœuds logiques de ressources d'énergie distribuées (CEI 61850-7-420:2009)

Kommunikationsnetze und -systeme für die Automatisierung in der elektrischen Energieversorgung - Teil 7-420: Grundlegende Kommunikationsstruktur - Logische Knoten für die dezentrale Energieversorgung (IEC 61850-7-420:2009)

CENELEC

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

Central Secretariat: Avenue Marnix 17, B - 1000 Brussels

Ref. No. EN 61850-7-420:2009 E

Foreword

The text of document 57/981/FDIS, future edition 1 of IEC 61850-7-420, prepared by IEC TC 57, Power systems management and associated information exchange, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 61850-7-420 on 2009-05-01.

The following dates were fixed:

– latest date by which the EN has to be implemented at national level by publication of an identical national standard or by endorsement	(dop)	2010-02-01
– latest date by which the national standards conflicting with the EN have to be withdrawn	(dow)	2012-05-01

Annex ZA has been added by CENELEC.

Endorsement notice

The text of the International Standard IEC 61850-7-420:2009 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following notes have to be added for the standards indicated:

IEC 60364-7-712	NOTE	Harmonized as HD 60364-7-712:2005 (not modified).
IEC 60870-5-101	NOTE	Harmonized as EN 60870-5-101:2003 (not modified).
IEC 60870-5-104	NOTE	Harmonized as EN 60870-5-104:2006 (not modified).
IEC 61800-4	NOTE	Harmonized as EN 61800-4:2003 (not modified).
IEC 61850	NOTE	Harmonized in EN 61850 series (not modified).
IEC 61850-6	NOTE	Harmonized as EN 61850-6:2004 (not modified).
IEC 61850-7-1	NOTE	Harmonized as EN 61850-7-1:2003 (not modified).
IEC 61850-8	NOTE	Harmonized in EN 61850-8 series (not modified).
IEC 61850-9	NOTE	Harmonized in EN 61850-9 series (not modified).
IEC 61850-10	NOTE	Harmonized as EN 61850-10:2005 (not modified).
IEC 61968	NOTE	Harmonized in EN 61968 series (not modified).
IEC 61970-301	NOTE	Harmonized as EN 61970-301:2004 (not modified).
IEC 62056	NOTE	Harmonized in EN 62056 series (not modified).
ISO/IEC 7498-1	NOTE	Harmonized as EN ISO/IEC 7498-1:1995 (not modified).

Annex ZA
(normative)

Normative references to international publications with their corresponding European publications

The following referenced documents are indispensable for the application 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.

NOTE When an international publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

Publication	Year	Title	EN/HD	Year
IEC 61850-7-2	2003	Communication networks and systems in substations - Part 7-2: Basic communication structure for substation and feeder equipment - Abstract communication service interface (ACSI)	EN 61850-7-2	2003
IEC 61850-7-3	2003	Communication networks and systems in substations - Part 7-3: Basic communication structure for substation and feeder equipment - Common data classes	EN 61850-7-3	2003
IEC 61850-7-4	2003	Communication networks and systems in substations - Part 7-4: Basic communication structure for substation and feeder equipment - Compatible logical node classes and data classes	EN 61850-7-4	2003
IEC 61850-7-410	-[1)]	Communication networks and systems for power utility automation - Part 7-410: Hydroelectric power plants - Communication for monitoring and control	EN 61850-7-410	2007[2)]
ISO 4217	-[1)]	Codes for the representation of currencies and funds	-	-

[1)] Undated reference.

[2)] Valid edition at date of issue.

CONTENTS

INTRODUCTION

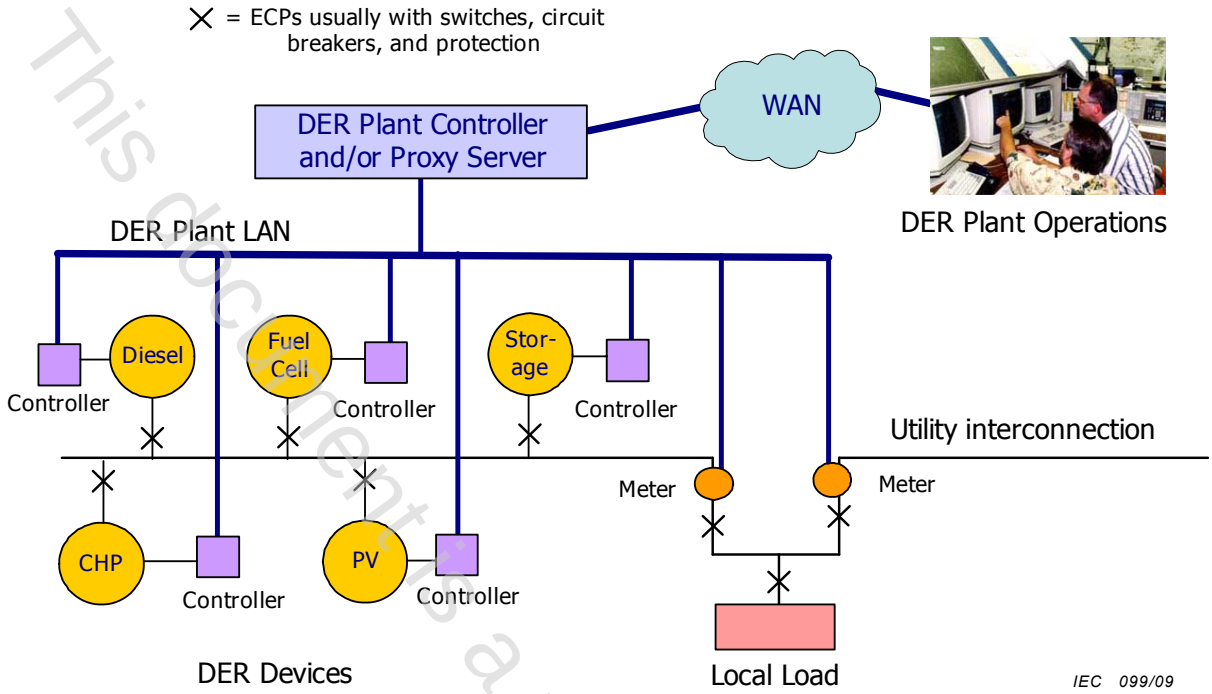
Increasing numbers of DER (distributed energy resources) systems are being interconnected to electric power systems throughout the world. As DER technology evolves and as the impact of dispersed generation on distribution power systems becomes a growing challenge - and opportunity, nations worldwide are recognizing the economic, social, and environmental benefits of integrating DER technology within their electric infrastructure.

The manufacturers of DER devices are facing the age-old issues of what communication standards and protocols to provide to their customers for monitoring and controlling DER devices, in particular when they are interconnected with the electric utility system. In the past, DER manufacturers developed their own proprietary communication technology. However, as utilities, aggregators, and other energy service providers start to manage DER devices which are interconnected with the utility power system, they are finding that coping with these different communication technologies present major technical difficulties, implementation costs, and maintenance costs. Therefore, utilities and DER manufacturers recognize the growing need to have one international standard that defines the communication and control interfaces for all DER devices. Such standards, along with associated guidelines and uniform procedures would simplify implementation, reduce installation costs, reduce maintenance costs, and improve reliability of power system operations.

The logical nodes in this document are intended for use with DER, but may also be applicable to central-station generation installations that are comprised of groupings of multiple units of the same types of energy conversion systems that are represented by the DER logical nodes in this document. This applicability to central-station generation is strongest for photovoltaics and fuel cells, due to their modular nature.

Communications for DER plants involve not only local communications between DER units and the plant management system, but also between the DER plant and the operators or aggregators who manage the DER plant as a virtual source of energy and/or ancillary services. This is illustrated in Figure 1.

Example of a Communications Configuration for a DER Plant



Key

CHP combined heat and power

WAN wide area network

DER distributed energy resources

PV photovoltaics

LAN local area network

Figure 1 – Example of a communications configuration for a DER plant

In basic terms, “communications” can be separated into four parts:

- information modelling (the types of data to be exchanged – nouns),
- services modelling (the read, write, or other actions to take on the data – verbs),
- communication protocols (mapping the noun and verb models to actual bits and bytes),
- telecommunication media (fibre optics, radio systems, wireless systems, and other physical equipment).

This document addresses only the IEC 61850 information modelling for DER. Other IEC 61850 documents address the services modelling (IEC 61850-7-2) and the mapping to communication protocols (IEC 61850-8-x). In addition, a systems configuration language (SCL) for DER (IEC 61850-6-x) would address the configuration of DER plants.

The general technology for information modelling has developed to become well-established as the most effective method for managing information exchanges. In particular, the IEC 61850-7-x information models for the exchange of information within substations have become International Standard. Many of the components of this standard can be reused for information models of other types of devices.

In addition to the IEC 61850 standards, IEC TC 57 has developed the common information model (CIM) that models the relationships among power system elements and other

information elements so that these relationships can be communicated across systems. Although this standard does not address these CIM relationships for DER, it is fully compatible with the CIM concepts.

The interrelationship between IEC TC 57 modelling standards is illustrated in Figure 2. This illustration shows as horizontal layers the three components to an information exchange model for retrieving data from the field, namely, the communication protocol profiles, the service models, and the information models. Above these layers is the information model of utility-specific data, termed the common information model (CIM), as well as all the applications and databases needed in utility operations. Vertically, different information models are shown:

- substation automation (IEC 61850-7-4),
- large hydro plants (IEC 61850-7-410),
- distributed energy resources (DER) (IEC 61850-7-420),
- distribution automation (under development),
- advanced metering infrastructure (as pertinent to utility operations) (pending).

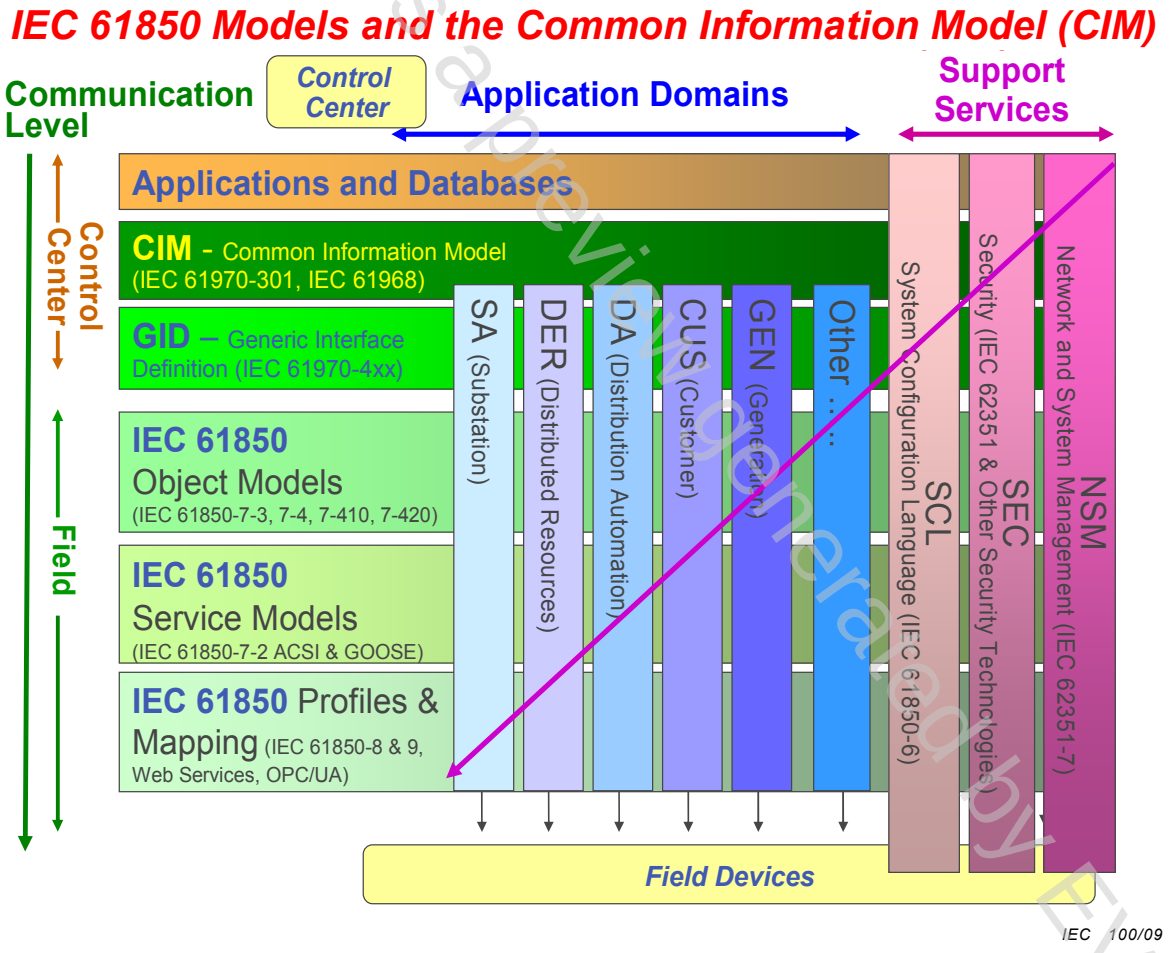


Figure 2 – IEC 61850 modelling and connections with CIM and other IEC TC 57 models

COMMUNICATION NETWORKS AND SYSTEMS FOR POWER UTILITY AUTOMATION –

Part 7-420: Basic communication structure – Distributed energy resources logical nodes

1 Scope

This International Standard defines the IEC 61850 information models to be used in the exchange of information with distributed energy resources (DER), which comprise dispersed generation devices and dispersed storage devices, including reciprocating engines, fuel cells, microturbines, photovoltaics, combined heat and power, and energy storage.

The IEC 61850 DER information model standard utilizes existing IEC 61850-7-4 logical nodes where possible, but also defines DER-specific logical nodes where needed.

2 Normative references

The following referenced documents are indispensable for the application 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 61850-7-2:2003, *Communication networks and systems in substations – Part 7-2: Basic communication structure for substations and feeder equipment – Abstract communication service interface (ACSI)* [1)]

IEC 61850-7-3:2003, *Communication networks and systems in substations – Part 7-3: Basic communication structure for substations and feeder equipment – Common data classes* [1)]

IEC 61850-7-4:2003, *Communication networks and systems in substations – Part 7-4: Basic communication structure for substations and feeder equipment – Compatible logical node classes and data classes* [1)]

IEC 61850-7-410, *Communication networks and systems for power utility automation – Part 7-410: Hydroelectric power plants – Communication for monitoring and control*

ISO 4217, *Codes for the representation of currencies and funds*

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1) A new edition of this document is in preparation.