SLOVENSKI STANDARD
SIST EN 50491-12-1:2018

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Splošne zahteve za stanovanjske in stavbne elektronske sisteme (HBES) in sisteme za nadzor in avtomatizacijo stavb (BACS) - Pametna omrežja - Aplikacijske specifikacije - Vmesnik in okvir za odjemalca - 12-1. del: Vmesnik med CEM in upravljalcem stanovanjskih in stavbnih virov - Splošne zahteve in arhitektura

General requirements for Home and Building Electronic Systems (HBES) and Building Automation and Control Systems (BACS) - Smart grid - Application specification - Interface and framework for customer - Part 12-1: Interface between the CEM and Home/Building Resource manager - General Requirements and Architecture

Allgemeine Anforderungen an die Elektrische Systemtechnik für Heim und Gebäude (ESHG) und an Systeme der Gebäudeautomation (GA) - Smart grid - Anwendungsspezifikaion - Struktur der Schnittstelle für Anwender - Teil 12-1: Schnittstelle zwischen CEM und Heim-/Gebäude-Ressourcenmanager - Allgemeine Anforderungen und Architektur

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English Version

General requirements for Home and Building Electronic Systems (HBES) and Building Automation and Control Systems (BACS) - Smart grid - Application specification - Interface and framework for customer - Part 12-1: Interface between the CEM and Home/Building Resource manager - General Requirements and Architecture

Exigences générales relatives aux systèmes électroniques pour les foyers domestiques et les bâtiments (HBES) et aux systèmes de gestion technique du bâtiment (SGTB) Réseau intelligent Spécification d'application Interface et cadre pour le client - Partie 12-1 : Interface entre le gestionnaire d'énergie pour le client (CEM, Customer Energy Manager) et le gestionnaire de ressources pour foyers domestiques/ bâtiments. Exigences et Architecture générales

Allgemeine Anforderungen an die Elektrische Systemtechnik für Heim und Gebäude (ESHG) und an Systeme der Gebäudeautomation (GA) - Smart grid - Anwendungsspezifikaion - Struktur der Schnittstelle für Anwender - Teil 12-1: Schnittstelle zwischen CEM und Heim-/Gebäude-Ressourcenmanager - Allgemeine Anforderungen und Architektur

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CENELEC

European Committee for Electrotechnical Standardization
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European foreword

This document (EN 50491-12-1:2018) has been prepared by the Technical Committee CLC/TC 205, “Home and Building Electronic Systems (HBES)”.

The following dates are fixed:

• latest date by which this document has to be implemented at national level by publication of an identical national standard or by endorsement	(dop)	2019-06-18
• latest date by which the national standards conflicting with this document have to be withdrawn	(dow)	2021-06-18

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EN 50491-12-1 is part of the EN 50491 series of European Standards - General requirements for Home and Building Electronic Systems (HBES) and Building Automation and Control Systems (BACS) - which will comprise the following parts:

— Part 1: General requirements;

— Part 2: Environmental Conditions;

— Part 3: Electrical Safety Requirements;

— Part 4-1: General functional safety requirements for products intended to be integrated in Building Electronic Systems (HBES) and Building Automation and Control Systems (BACS);

— Part 5-1: EMC requirements, conditions and test set-up;

— Part 5-2: EMC requirements for HBES/BACS used in residential, commercial and light industry environment;

— Part 5-3: EMC requirements for HBES/BACS used in industry environment

— Part 6-1: HBES installations - Installation and planning;

— Part 6-3: HBES installations - Assessment and definition of levels;

— Part 11: Smart Metering – Application Specification – Simple External Consumer Display;

— Part 12: Smart grid - Application specification - Interface and framework for customer;

— Part 12-1: Interface between the CEM and Home/Building Resource manager– General Requirements and Architecture

— Future Part 12-2: Interface between the Home/Building CEM and Resource manager(s)– Data model and messaging

— Future Part 12-3: Home/Building Customer Energy Manager (CEM)

— Future Part 12-4: Resource manager

Introduction

Traditional electricity networks make use of a primarily one-way flow of energy and communication from the generator to the consumer via the transmission and distribution systems.

Although there is some monitoring and control of equipment in the transmission and distribution systems, there is no communication with, or control of, consumer equipment. In particular, there is no means of requesting short-term control of consumer equipment according to generation and/or transmission/distribution grid conditions. Generation equipment is controlled according to the open-ended (uncontrolled) demand of the consumer.

Today we are faced with an increase of energy consumption, this is directly connected to an increase of CO_2 production. The increased CO_2 density in the atmosphere supports the climate warming of the earth.

One significant way to cope with the increased energy consumption without increasing the CO_2 production is to use more renewable energy resources.

Unfortunately, the available renewable energy supply is not aligned with the energy demand. To increase efficiency, the energy demand should be aligned as much as possible with the available energy supply. To reach this goal communication between the various equipment and systems of the stakeholders within the energy field is necessary. This grid, exchanging information and energy between producers, consumers, distributors and metering is known as the “Smart Grid”.

The EN 50491-12 series describes aspects of this smart grid that relate specifically to the premises (home/building) part of the smart grid, including the common interface between equipment in the premises and the smart grid.

1 Scope

This document specifies General Requirements and Architecture of an application layer interface between the Customer Energy Manager (CEM) and Smart Devices (SD) operating within the smart grid premises-side system (i.e. home or building but not industrial premises).

This document does not include requirements for:

– Safety;

– EMC;

– Data security; it is assumed that the underlying protocols will take the data security aspect into account;

NOTE Although data security is not within the scope of this standard, in Clause 4 some high-level design guidelines for data security are provided.

– Special equipment (e.g. legacy heat pumps) with a direct physical connection to the grid, as such equipment bypasses the CEM and is not HBES/BACS enabled (covered by other standards than the EN 50491 series).

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.

EN 50491-12, (all parts), *General requirements for Home and Building Electronic Systems (HBES) and Building Automation and Control Systems*

3 Terms, definitions and abbreviations

3.1 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

• IEC Electropedia: available at http://www.electropedia.org/

• ISO Online browsing platform: available at http://www.iso.org/obp

3.1.1
Customer Energy Manager
CEM
internal automation function for optimizing the energy consumption, production and storage within the premises according to the preferences of the customer using internal flexibilities and typically based on external information received through the Smart Grid Connection Point and possibly other data sources

3.1.2
Customer Energy Manager System
CEM system
allows the management of energy consumption, production and storage within the premises, consisting of a CEM connected to one or more Resource Managers which themselves act as gateways to HBES / BACS, SASS and / or Smart Appliances

3.1.3
Energy Management Gateway
EMG
access point (functional entity) sending and receiving smart grid related information and commands between an actor in the Grid and the CEM, letting the CEM decide how to process the events

Note 1 to entry: The communication is often ensured through an internet connection.

3.1.4
Head End System
HES
system that receives metering data in the advanced metering infrastructure

3.1.5
Home and Building Electronic Systems / Building Automation Control Systems
HBES / BACS
logical group of devices which uses a multi-application communication system where the functions are distributed and linked through a common communication process

Note 1 to entry: HBES/BACS is used in homes and buildings plus their surroundings. Functions of the system are e.g.: switching, open loop controlling, closed loop controlling, monitoring and supervising.

Note 2 to entry: In literature, HBES/BACS may be referred also as “home control system/network“, „home electronic systems” “building automation systems” etc.

Note 3 to entry: Examples of HBES/BACS applications are the management of lighting, heating, energy, water, fire alarms, blinds, different forms of security, etc.”. See introduction in EN 50491–4-1.

3.1.6
schema
abstract model that documents and organizes the data required in a defined way, so it can be used for different purposes such as exchanging and / or storing information

3.1.7
Local Network Access Point
LNAP
specific Network Interface controller between the Local Network (within the premises) and a system acting as back-end for the metering communication, which controls and monitors the communication to metering devices (instruments for measuring, memorizing data related to the consumption of commodity)

3.1.8
Meter Data Management
MDM
software system that performs long-term data storage and management for the vast quantities of data delivered by smart metering systems

3.1.9
resource manager
software component that exclusively represents a logical group of devices or a single smart device, and is responsible for sending unambiguous instructions to the logical group of devices or to a single device, typically using a device-specific protocol

Note 1 to entry: In the context of this document the Resource Manager manages the energy flexibility of a logical group of devices or a single smart device.

Note 2 to entry: The Resource Manager may be implemented in a special device, in the smart device itself or outside of the device

3.1.10
Neighbourhood Network Access Point
NNAP
specialized Network Interface Controller between the Neighbourhood Network and Wide Area Network (WAN), see CEN/CLC/ETSI TR 50572

3.1.11
premises
can be a public or private building/home where energy is used and/or produced

3.1.12
smart appliance
device that consumes energy that can be controlled by a Resource Manager, such as a washing machine, a freezer, a dishwasher

3.1.13
Smart Device
SD
device that can consume, produce or store energy (or a combination thereof) and that can be controlled by a Resource Manager for the purpose of energy management, such as a lighting controller, an electric vehicle, a smart appliance, a renewable power source, an energy storage system

3.1.14
Smart Grid Connection Point
SGCP
physical and logical borderline / interface from the customer to the network/market or from the network/market to the customer

Note 1 to entry: The SGCP can be implemented by one or more separate interfaces.

3.1.15
Smart meter gateway
SMG
interface between the premises and the metering network

Note 1 to entry: The SMG may have three interfaces, one to the HAN (Home Area Network), one to the LMN (Local Metrological Network) which is the interface to the different meters and one interface to the WAN (Wide Area Network).

Note 2 to entry: The smart meter gateway can be a part of a meter.

3.1.16
Single Application Smart System
SASS
group of devices having a communication interface for a single application such as heating or lighting, that consume, produce or store energy (or a combination thereof) and that can be controlled by a Resource Manager for the purpose of energy management

3.1.17
aggregator
actor whose goal it is to maximize the value of flexibility, taking into account customer needs, economical optimization and grid capacity

3.2 Abbreviations

BACS	Building Automation Control Systems
CEM	Customer Energy Manager
CHP	Combined Heat and Power
DER	Distributed Energy Resources
EMG	Energy Management Gateway
H1	Local connection to simple external consumer display
H2	Connection between the SMG and EMG
HES	Head End System
HBES	Home and Building Electronic System
LNAP	Local Network Access Point
MDM	Meter Data Management
MCF	Meter Communication Function
NNAP	Neighbourhood Network Access Point
SASS	Single Application Smart System
SD	Smart Device
SGCG	Smart Grid Co-ordination Group, reporting to CEN-CENELEC-ETSI and in charge of answering the M/490 mandate
SGCP	Smart Grid Connection Point
SMG	Smart Meter Gateway
S1	Interface between Energy management gateway and CEM
S2	Interface between CEM and Resource Manager

4 Design considerations

4.1 General

For designing a system like the Smart Grid, some general design considerations have to be taken into account. One important requirement for the Smart Grid is data security and data privacy.

4.2 Data security / privacy design guidelines

4.2.1 General

Data security and privacy should protect the system and keep the data private as much as possible.

Data security / privacy shall distinguish between the data security / privacy related to the Smart Grid side and the data security / privacy within the Smart Grid premises side.

4.2.2 Data security / privacy on the smart grid side

It should not be possible to attack and impair the data. Data privacy can be achieved only by permitting the exchange of aggregated energy management related data and / or private data for which the customer has given permission to be used by a third party.

4.2.3 Data security / privacy on premises side

Data security / privacy on the premises side shall ensure that the data can only be read by authorized persons and cannot be manipulated. Depending on the implementation of the system this can be reached with different methods, for example:

– Data encryption and decryption;

– Constructive design (avoid that no one except authorized persons can gain access the devices and communication channel).

4.2.4 Customer Energy Management System security

The security of the Customer Energy Manager System (CEMS) is linked to the number of connections between the CEMS and the Neighbourhood Network. Every connection attempt between the CEMS and the Neighbourhood Network shall be vetted to avoid unauthorized access to the CEMS. The more connections are between the two networks then the more effort shall be spent for configuring of the different Firewalls and the higher is the risk of security holes. Therefore, it is recommended to limit the connection points between the CEMS and the Neighbourhood Network as much as possible. Ideally there is only one connection between the CEMS and the Neighbourhood Network.

4.3 Device type agnostic energy management

While today there is a set of common devices and appliances (e.g. freezers, TV sets, electric bikes, …), the data structures of the interface between the CEM and a Resource Manager should be designed in such a way that even future device types can be correctly managed without the need to update the communication standard.

4.4 Clock alignment

The main task for a CEM is to manage energy, which basically are variations of (average) power over time. One of the key CEM data structures is therefore a power profile and it makes “time” a central and very important aspect.

“Time” seems like a trivial concept. Humans tend to think of “absolute” time in the form of a “date” plus a “24-hour clock” information. But on a technical level it is not that trivial at all, because there are aspects like time zones, different calendars, daylight saving time, leap seconds, hardware clock drift and the overall question of how to actually synchronize multiple clocks to a desired type and precision of alignment.

This is why the CEM architecture shall incorporate a concept of clock alignment with a well-defined master clock and time synchronization rules and procedures.

5 Background

The traditional model of the grid will lead to increased inefficiencies as electricity energy consumption and the connection of distributed (renewable) energy resource equipment is increased.

In order to combat these problems, the architecture of traditional grids is being extended to include remote control of distributed loads and energy resources, requiring bi-directional communication. This is the “Smart Grid”.

Smart grids rely on flexibility in energy production and/or consumption to compensate for imbalance and congestion in the grid, for example caused by:

– Increasing electricity demand by electric vehicle charging;

– Increasing numbers of renewable energy sources that are far less predictable/controllable than traditional power plants.

The use of devices and equipment in homes and buildings that are able to control their energy consumption or generation (either locally or remotely) greatly enhances the flexibility capability of a smart grid.