SLOVENSKI STANDARD
SIST EN 50491-12-2:2022

01-julij-2022

Splošne zahteve za stanovanjske in stavbne elektronske sisteme (HBES) in sisteme za avtomatizacijo in krmiljenje stavb (BACS) - 12-2. del: Pametno omrežje - Aplikacijske specifikacije - Vmesnik in okvir za odjemalca - Vmesnik med upravljalcem stanovanjskih in stavbnih virov (CEM) - Podatkovni model in izmenjava podatkov

General requirements for Home and Building Electronic Systems (HBES) and Building Automation and Control Systems (BACS) - Part 12-2: Smart grid - Application specification - Interface and framework for customer - Interface between the Home / Building CEM and Resource manager(s) - Data model and messaging

Exigences générales relatives aux systèmes électroniques pour les foyers domestiques et les bâtiments (HBES) et aux systèmes de gestion technique du bâtiment (SGTB) - Partie 12-2 : Réseau intelligent - Spécification d'application - Interface entre le gestionnaire d'énergie pour le client (CEM, Customer Energy Manager) et le gestionnaire de ressources pour foyers domestiques/bâtiments - Modèle de données et échange de messages

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ICS:

35.240.67	Uporabniške rešitve IT v gradbeništvu	IT applications in building and construction industry
97.120	Avtomatske krmilne naprave za dom	Automatic controls for household use

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English Version

General requirements for Home and Building Electronic Systems (HBES) and Building Automation and Control Systems (BACS) - Part 12-2: Smart grid - Application specification - Interface and framework for customer - Interface between the Home / Building CEM and Resource manager(s) - Data model and messaging

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Allgemeine Anforderungen an die Elektrische Systemtechnik für Heim und Gebäude (ESHG) und an Systeme der Gebäudeautomation (GA) - Teil 12-2: Smart grid - Anwendungsspezifikation - Schnittstelle und Modell für Anwender - Schnittstelle zwischen dem Heim-/Gebäude CEM und den Ressourcenmanagern - Datenmodell und Informationsaustausch

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Europäisches Komitee für Elektrotechnische Normung

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European foreword

This document (EN 50491-12-2:2022) has been prepared by CLC/TC 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)	2023-02-17
• latest date by which the national standards conflicting with this document have to be withdrawn	(dow)	2025-02-17

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This document 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: Electric 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;

— 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

Over recent decades, energy production and its consumption patterns have changed dramatically. Although central energy production is still dominant, the trend for distributed production is distinctive following an increasing number of renewables. Alternative energy sources are highly fluctuating in their production capabilities, which may result in the grid operators having difficulty to keep a balance between energy production and consumption. The complexity of keeping the grid reliable is further increased by the change in the electric energy consumption and production of the customer itself, e.g. the use of electric vehicles and personal generation facilities.

A Smart Grid that allows the grid operator to be flexible and reactive is needed. Such reactivity requires a communication flow between energy consuming and producing entities, from single family houses to large factories.

The EN 50491-12 series describes aspects of the smart grid that relate specifically to the premises (home/building) part of the smart grid and describes the common interface between equipment in the premises and the smart grid. This part 2 of the series defines the fundamental aspects of semantic interoperability for the S2 interface and the related data exchange between a CEM and the Resource Managers within the premises.

Different use cases are explained in Annex A, which should help to understand the philosophy of this document.

1 Scope

This document specifies the fundamental aspects of semantic interoperability for the S2 interface and the related data exchange between a CEM and the Resource Managers within the premises. It provides a technology independent set of data models and interaction patterns in order to enable applications for Energy Management within the premises. This document does not include:

— mappings to concrete data representations (XML, JSON and similar);

— mappings to application protocols for the message passing;

— security related aspects.

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.

ISO/DIS 15118-20, *Road vehicles — Vehicle to grid communication interface*

ISO 4217, *Codes for the representation of currencies*

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:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

3.1.1
Power Envelope Based Control
coordination of the CEM based on limitations to the device

Note 1 to entry: The CEM can set minimum and maximum values for the power that shall not be exceeded by the device.

3.1.2
Power Profile Based Control
control type where coordination from the CEM is based on profile modification, including concepts of sequence shifting, sequence selection

3.1.3
Operation Mode Based Control
control type where the resource manager offers the CEM multiple operation modes that the CEM could choose from

Note 1 to entry: The behaviour of the device will be modified by selecting operation modes.

3.1.4
Fill Rate Based Control
control type based on measurements indicating the fill level and the fill rate

3.1.5
Demand Driven Based Control
control type where the CEM can decide how a given demand should be fulfilled

3.1.6
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.

Note 3 to entry: The Resource Manager typically consist of a communication handler (information layer, strictly related to data format and protocol handling) and an application handler (application layer, related to functional extensions of the CEM).

3.1.7
role
categorization of the behaviour of a participant by its capabilities related to energy management, each participant at least supporting one

3.1.8
S1 communication
interface between CEM and energy management gateway

3.1.9
S2 communication
interface between CEM and resource manager

3.1.10
smart grid
electric grid including a variety of operational and energy measures as well as control of the production and distribution of electricity

3.1.11
smart grid operator
instance requesting energy profiles from the CEM in order to keep the grid stable and reliable

3.1.12
tariff based energy management
optimization strategy for energy management based on variable tariffs according to user's requirements

3.1.13
time slot
fixed period of time with a specific duration

3.1.14
use case
describes interactions between an actor and another actor or a system to achieve a specific goal, either very abstract or very detailed; can be nested

3.1.15
user
either a person (e.g. installer or resident) or surrogate service

3.1.16
prosumer
household or device that produces and consumes energy of the same commodity

3.1.17
single application smart system
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

3.1.18
home and building electronic system
building automation control system
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 could also be referred to as “home control system/network“, “home electronic system” “building automation system”, 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.

3.1.19
abnormal condition
situation in which a Resource Manager shall sacrifice user comfort when requested by the CEM

3.2 Abbreviations

Abbreviation	Description
API	Application Programmable Interface
BACS	Building Automation Control Systems
CEM	Customer Energy Management
CHP	Combined Heat and Power
DDBC	Demand Driven Based Control
EM	Energy Management
EMG	Energy Management Gateway
EV	Electric Vehicle
FRBC	Fill Rate Based Control
HBES	Home and Building Electronic Systems
HMI	Human-Machine Interface

Abbreviation	Description
I/F	Interface
M/O	Mandatory / Optional
M	Mandatory
O	Optional
OMBC	Operation Mode Based Control
PEBC	Power Envelope Based Control
PPBC	Power Profile Based Control
PV	Photovoltaics
RM	Resource Manager
RTP	Real Time Pricing
SASS	Single Application Smart System
SG	Smart Grid
TBEM	Tariff Based Energy Management
TOU	Time Of Use
95PPR	95 Percent Probability Range
68PPR	68 Percent Probability Range

4 Energy management

4.1 Architectural overview

In EN 50491-12-1, the system architecture of the Smart Grid premises side is described. It includes the common interface between the equipment in the home/building, referred to as the Customer Energy Manager (CEM), and the Smart Grid (SG), referred to as the Energy Management Gateway (EMG). The communication between the EMG and the CEM is referred to as the S1 communication whereas the communication between the CEM and the Resource Manager on the premises side is referred to as the S2 communication.

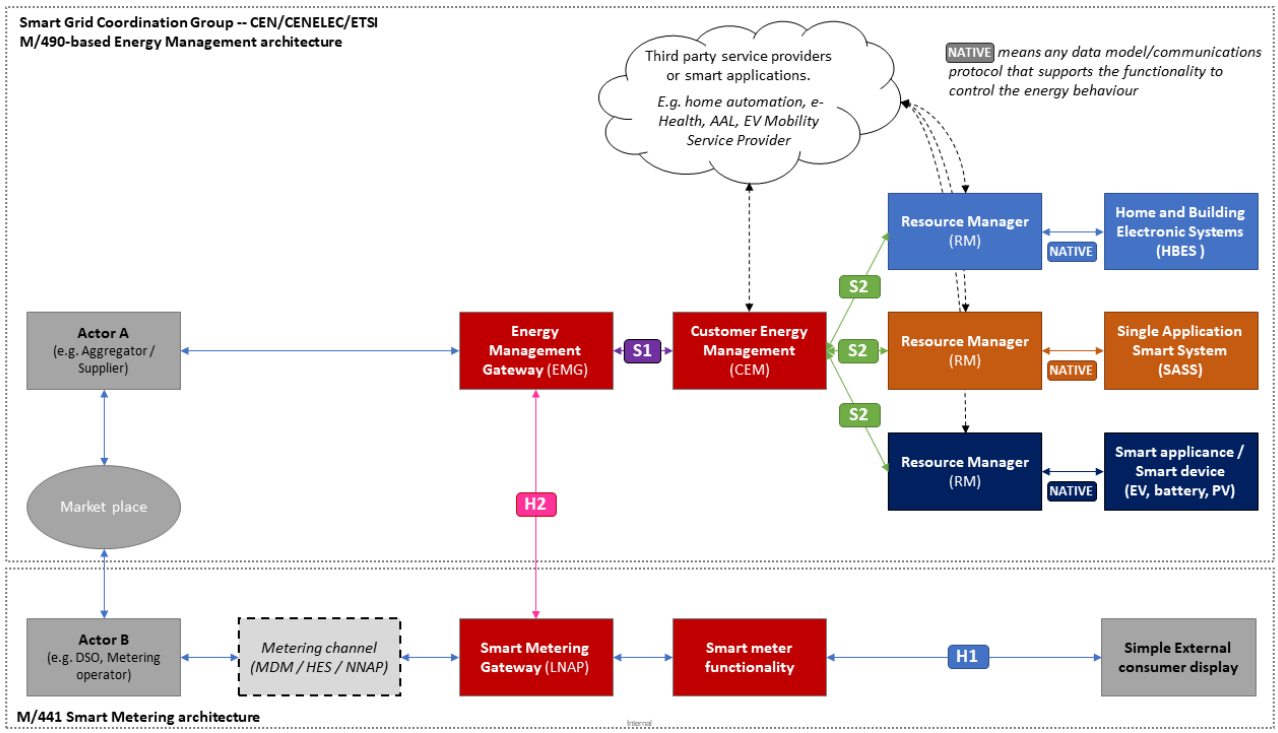

Figure 1 — Architectural overview of Premises smart grid system

Although the solution specified in this document mainly refers to S2 Communication, data that will be transmitted via S1 needs to be considered as well. However, this document does not specify S1 Communication.

4.2 Definition

A HBES/BACS/SASS or (Smart) device is usually purchased to fulfil a goal of the end user of the device or devices. For example, the goal of the end user of an electric boiler is to have hot tap water, and the goal of the end user of a heat pump is to have a comfortable room temperature. Meeting these goals is what is defined as user comfort.

Although these goals shape the behaviour of a Smart Device, they do not completely define it. There might be multiple ways in which the goal of the end user can be achieved. For example, when there is still enough hot water in the electric boiler, the heating of the water could be postponed. In other words, there is some flexibility in achieving the goal of the end user. This is illustrated by Figure 2.

A battery or electric vehicle has a particular target state of charge at a particular moment in time. There are multiple ways to achieve this target, each with their own associated power profile. While all power profiles achieve the target state, these profiles can have a big impact on the power grid. Influencing how a device achieves its targets is what is defined as Energy Management. However, not all HBES / BACS /SASS or (Smart) devices have an explicit goal. For example, the sole purpose of a stationary battery might be to perform Energy Management; there is no other goal from the end user.

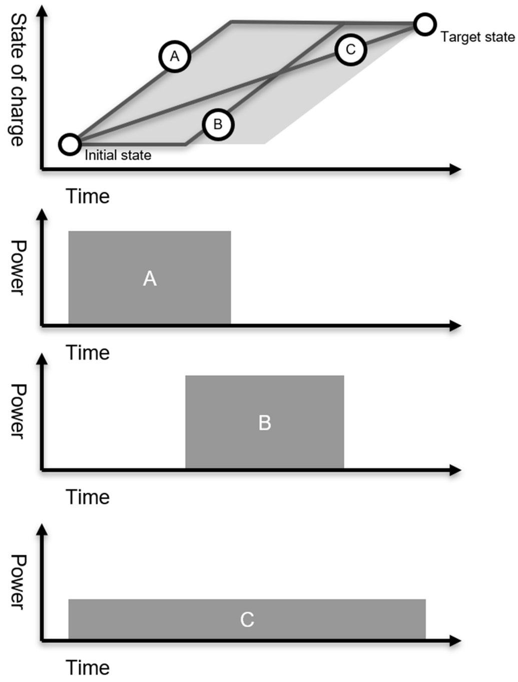

Figure 2 — Example of how different power profiles can achieve the same target state

Energy Management always involves one or multiple types of energy which are exchanged with the grid, such as electricity (exchanged with a power grid), natural gas (exchanged with a gas grid) or heat (exchanged with a heat grid). These types of energy might be interconnected in the behaviour of the device.

For example, a (micro) CHP typically consumes natural gas, but at the same time produces electricity. For Energy Management purposes, it is necessary to know the behaviour of HBES / BACS /SASS or (Smart) devices with respect to these types of energy. These different energy types that are exchanged with a grid are referred to as commodities.

4.3 Energy Management roles

4.3.1 General

In the S2 ecosystem, there are multiple entities fulfilling roles. This subclause gives an overview of these roles and gives concrete examples. Each role assumes a specific functionality and behaviour for a specific Commodity and is attributed to the entity by the entity itself. Entities referred to with roles are defined as EM (Energy Management) Participants. EM participants can fulfil one or multiple of these roles:

— energy management;

— energy producer;

— energy consumer;

— energy storage.

4.3.2 Energy producer role

4.3.2.1 Description

An Energy Producer is an EM participant that produces energy. It can operate under specific capabilities and constraints such as additional costs or the maximum amount of energy. As other EM participants, especially the CEM, need to know these capabilities and constraints, each Energy producer shall provide a control type that contains those capabilities and constraints.