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Part 5-2: Energy management and measurement application (EMMA)

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Introduction

This draft standard is based on national and international discussions. Your comments on this draft are invited and will assist in the preparation of the consequent standard.

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Date: xx/xx/20xx	Document: ISO/DIS xxxx
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1	2	(3)	4	5	(6)	7
MB	Clause No./ Subclause No./Annex (e.g. 3.1)	Paragraph/Figure/ Table/Note	Type of comment	Commend (justification for change) by the MB	Proposed change by the MB	Secretariat observations on each comment submitted
	3.1	Definition 1	ed	Definition is ambiguous and needs clarifying.	Amend to read '...so that the mains connector to which no connection...'	
	6.4	Paragraph 2	te	The use of the UV photometer as an alternative cannot be supported as serious problems have been encountered in its use in the UK.	Delete reference to UV photometer.	



JTC1-SC25/3273/CD

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Germany

SECRETARY:

Mr Marco Peter

OF INTEREST TO THE FOLLOWING COMMITTEES:

TC 23,SC 23K,TC 57,SyC AAL,ISO/IEC JTC 1/SC 41

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TITLE:

Information Technology - Home Electronic System (HES) gateway - Application services - Part 5-2: Energy management and measurement application (EMMA)

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

**INFORMATION TECHNOLOGY –
HOME ELECTRONIC SYSTEM (HES) GATEWAY****Application Services****Part 5-2: Energy management and measuring application (EMMA)**

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The text of this International Standard is based on the following documents:

Draft	Report on voting
XX/XX/FDIS	XX/XX/RVD

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

146 The language used for the development of this International Standard is English.

147 This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in
148 accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement,
149 available at www.iec.ch/members_experts/refdocs. The main document types developed by
150 IEC are described in greater detail at <http://www.iec.ch/standardsdev/publications>.

151 The committee has decided that the contents of this document will remain unchanged until
152 the stability date indicated on the IEC website under webstore.iec.ch in the data related to
153 the specific document. At this date, the document will be

- 154 • reconfirmed,
- 155 • withdrawn,
- 156 • replaced by a revised edition, or
- 157 • amended.

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INTRODUCTION

The *Home Electronic System* (HES) is a set of standards that support communication, control, and monitoring applications for homes and buildings. However, homes and buildings present a heterogeneous and changing networking environment, and many of these networks and applications (including some HES standards) are not directly interoperable with each other. HES standards achieve interoperability through the ISO/IEC 15045 *HES gateway* and ISO/IEC 18012 *Guidelines for product interoperability* standards. These standards enable functional interworking among home devices and applications that may use dissimilar protocols and networks installed in this environment.

The HES gateway enables an open and adaptable market for incompatible products by specifying a standardized modular system intended to provide interoperability among the networks found in homes and buildings. The HES interoperability process does not require modification of the various networks, applications, or protocols that use it. Appropriate interworking functions translate network messages through interface modules to a common lexicon expression, which is then exchanged through a private internal network bus protocol. A protected application platform using this internal bus protocol supports an expanding array of services for both the applications and the network.

In summary, the HES gateway standard series specifies a standardised, modular, dedicated private Internet network system. The HES gateway system includes:

- interfaces (i.e., *interface* modules) for communication and semantic translation among dissimilar home and building area networks (HANs), as well as with external wide area networks (WANs), and
- a platform for supporting an expanding array of interoperable application services (i.e., *service* modules), and
- a secure and private communications path among these modular elements with access restricted to the appropriate elements to protect data, safety and privacy.

Purpose

The purpose of this document is to provide an architectural model and description of a specific class of application services for energy management. It applies the energy management model, and specifically the “energy management agent” (EMA) in ISO/IEC 15067-3 to create an application for energy management and measurement (EMMA) to be hosted on the HES gateway application platform as specified in ISO/IEC 15045-5-1, which describes the general gateway framework for all application services and includes:

- the basic requirements to support the application services, and
- guidance for hosting specific applications.

Figure 1 shows the core interoperability and HES gateway series of standards (ISO/IEC 18012 series and ISO/IEC 15045 series).

Figure 2 shows the ISO/IEC 15045-5 series of standards, and where this Part 5-2 fits into the series. The bottom shaded part of the figure is a miniaturized version of Figure 1.

The HES gateway application platform specified in ISO/IEC 15045-5-1 is intended to encourage the development of independent open-source application software (i.e., plug-in apps) including a growing library of network interface modules and of applications and service agents for existing and new home and building appliances, products, and functions.

Grid and premises energy

Since its introduction, electricity has largely been supplied by large, centralized sources (e.g., hydroelectric dams, coal-fired steam generating plants, etc.) external to the premises where electricity is used, and has been delivered via utility transmission lines and local distribution grids. The emergence of economical wind and solar energy technologies has encouraged the growth of “distributed” generation sources (e.g., solar farms, wind farms, hydro, etc.) situated apart from the conventional central generating facilities of utilities. These distributed sources are commonly referred to as “distributed energy resources” or “DER”. More recently, renewable energy technologies have become feasible so distributed generation and storage of electricity can be situated locally in the distribution grid or on the user's premises, (e.g., rooftop solar photovoltaic panels (PV), inverters, batteries, etc.) and usually can be under the user's control, referred to here as premises energy resources or “PER”¹.

Since the wide-scale introduction of electricity in the early 20th century, the availability and management of electricity to meet growing demands, initially for lighting and subsequently for machinery and appliances, has been important to users and suppliers (i.e., utilities), primarily for cost and efficiency reasons. However, in recent years advances in electronic technology have made distributed generation (and storage) economically feasible. Therefore, premises-based energy management has taken on added importance to handle the dynamic strategies required to support fluctuating and diverse sources of power using these new technologies, and to address environmental concerns, increasing climate disruption, and user and community resilience.

Energy management and measurement

EMMA combines two closely interdependent and complementary functions: electricity measurement and management. This document introduces local power measurements at the point of use by selected appliances to facilitate the decisions made by an energy management agent (EMA) (or set of agents). The “premises energy management agent” (PEMA) is defined in this document as an EMA that resides within the HES Gateway as a set of application services (agents) for allocating power to various services based on consumer desires and goals. The basic categories of power measurement are

- direct current (DC) such as batteries, and
- alternating current (AC), such as household power.

Locations where local power measurements are recommended include:

- Solar and wind power generation (at inverter inputs or outputs)
- Stationary batteries (DC)
- Mobile batteries in electric vehicles (EVs) (AC or DC)
- Appliances and other loads (AC or DC)
- Utility or aggregator power via the grid (AC)

These energy measurements are primarily intended to enable effective energy management and control by providing the PEMA with electricity flow and power quality data, and with analysis of loads (application systems or specific appliances), local generation, and storage. Measurement techniques have advanced in accuracy with reduced costs to enable such on-premises measurements. These distributed measurement devices on premises combined with a PEMA comprises EMMA. EMMA supports measurement of electrical parameters and power

¹ DER (Distributed Energy Resources) can refer to grid scale facilities (such as a solar or wind farm operated by a public utility), to community scale facilities, or to on-premises facilities. In this standard the term PER (Premises Energy Resources) refers to DER located on the premises and controlled by equipment on the premises.

flows in order to determine the optimal allocation of power according to the consumer's goals (i.e., manage the cost of electricity and limit the environmental impact of the premises electricity usage), and to improve power quality, thereby increasing energy efficiency for the premises and connected grid, and reducing interference with other electrical systems.

Premises Storage

The EMMA system facilitates the utilization of electricity storage (e.g., battery, electrical storage capacitor, hot water, etc.) and the associated functions to utilize it (e.g., charging, discharging, dispatch, monitoring, management, etc.), but does not require it. As costs fall, it is anticipated that premises storage devices will become essential for providing effective premises management and resilience.

Prioritization of premises electricity loads and uses

A basic function of EMMA is to prioritize, sustain, and manage basic premises services under varying conditions of abundance or scarcity of electricity sources for the premises. Such basic premises services include, but are not limited to the following essential services or appliances:

- Refrigeration (i.e., food supply security)
- Water (e.g., well pumps)
- Lights (i.e., basic lighting for safety and convenience)
- Communications (e.g., voice, data, phone charging, etc.)
- Heating (e.g., Habitability of premises, prevention of freezing, etc.)
- EV charge management

[Editors' note: text to be added]

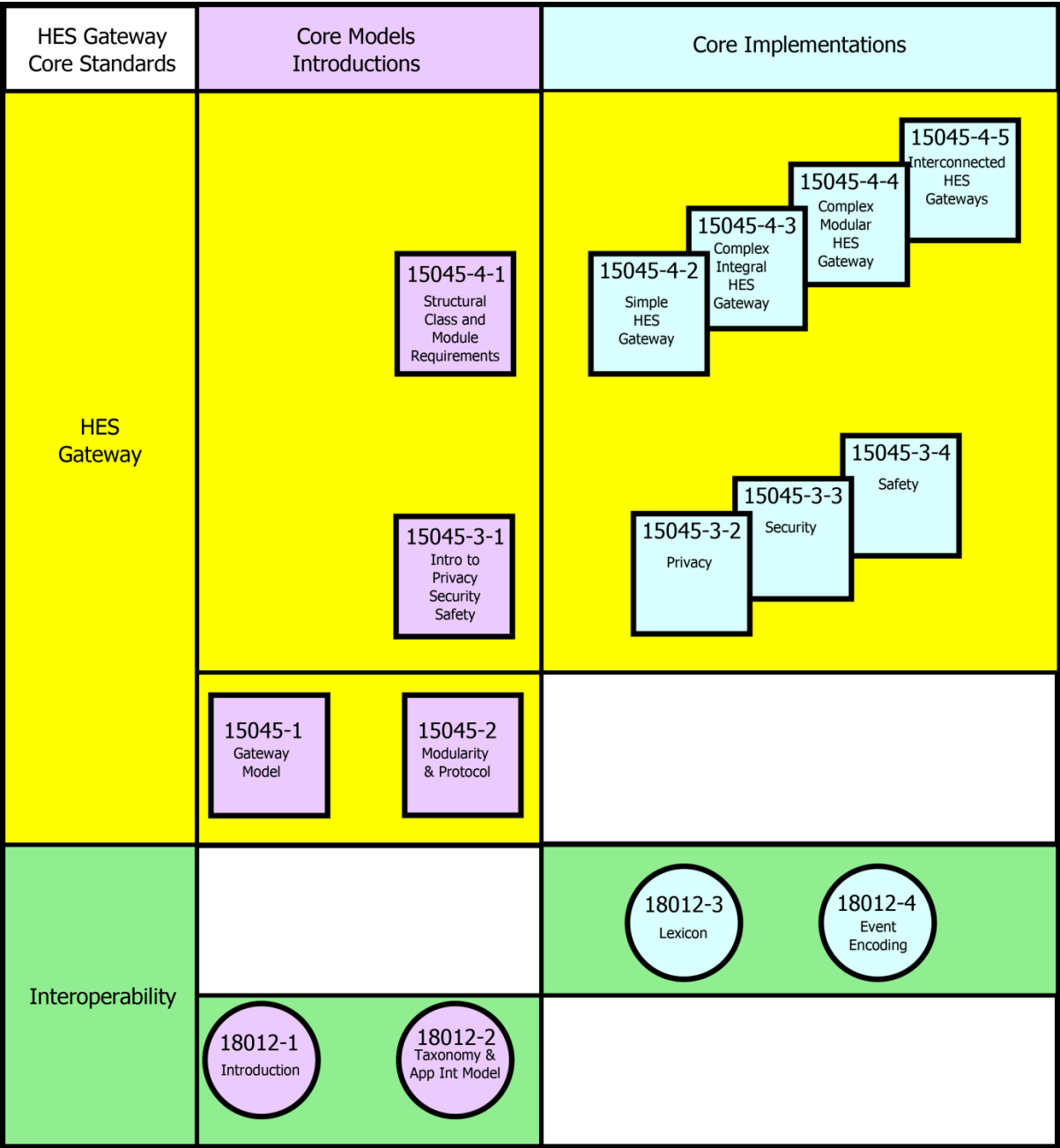


Figure 1 – Core Interoperability and HES gateway Standards

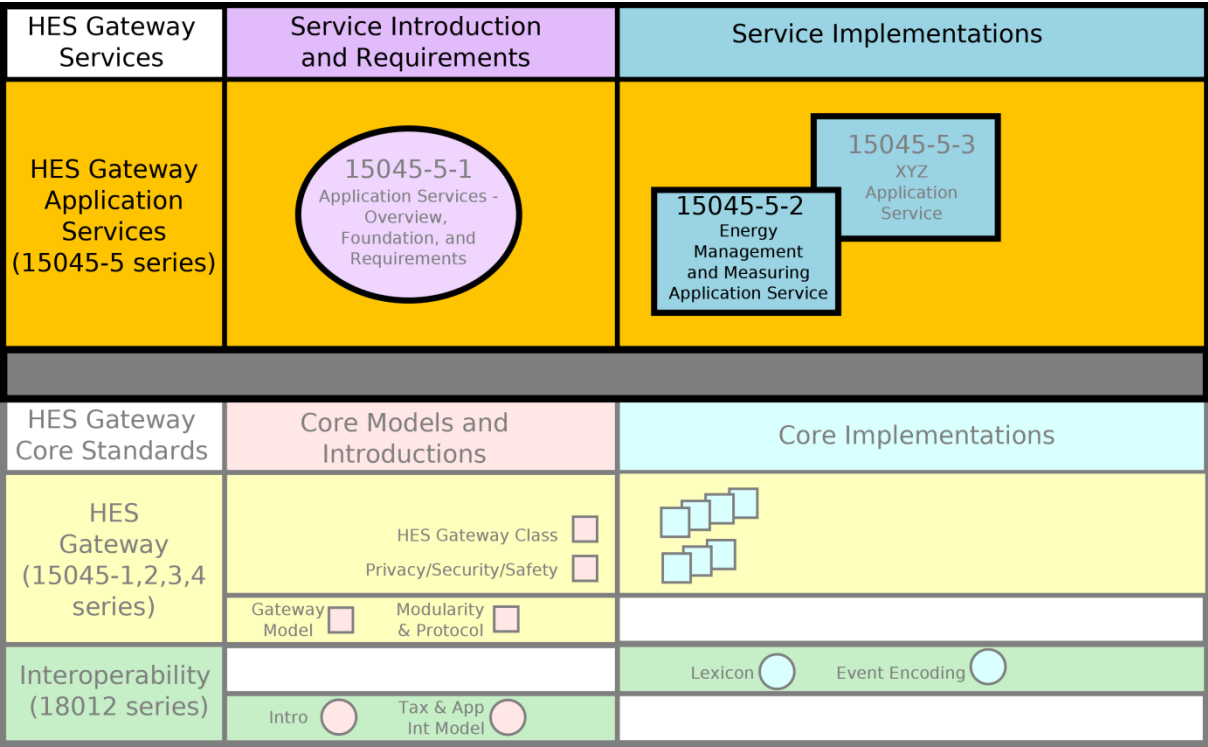


Figure 2 – Energy Management and Measuring Application Services Standard

INFORMATION TECHNOLOGY – HOME ELECTRONIC SYSTEM (HES) GATEWAY

Application services

Part 5-2: Energy management and measuring application (EMMA)

1 Scope

This document provides a reference architecture for an energy management and measuring application (EMMA) service for on-premises home and building use, generation, and storage of electricity with a primary focus on the needs of the premises. It also provides generalized models and requirements of premises energy bus systems including products, and basic operational functions. It describes the requirements for a solar-plus-storage control and monitoring system for energy management.

This application is hosted in the HES gateway applications platform as specified in ISO/IEC 15045-5-1 for hosting this application. The HES gateway application platform is private and secure for hosting a variety of applications including this energy management application. A distributed measuring system to monitor power flow within the premises is specified to support the energy management system. This document specifies the functionality and architecture of the system, including the modularity of energy management and measuring application (EMMA) agents (i.e., PEMAs), and a local network for data acquisition including power measuring for both AC and DC loads, storage, and generation situated on-premise. The EMMA/PEMA agents are based on the Energy Management Agent (EMA) specified in ISO/IEC 15067-3.

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/IEC 15045-1:2004, *Information Technology – Home Electronic System (HES) gateway – Part 1: A residential gateway model for HES*

ISO/IEC 15045-2:2012, *Information Technology – Home Electronic System (HES) gateway – Part 2: Modularity and protocol*

ISO/IEC 15045-3-1, *Information technology – Electronic System (HES) gateway – Part 3-1: Introduction to privacy, security, and safety [In progress]*

ISO/IEC 15045-3-2, *Information technology – Home Electronic System (HES) gateway – Part 3-2: Privacy framework [In progress]*

ISO/IEC 15045-4-1, *Information technology – Home Electronic System (HES) gateway – Part 4-1: HES gateway structural class and module requirements [In progress]*

ISO/IEC 15045-5-1, *Information technology – Home Electronic System (HES) gateway – Part 5-1: Application Services Overview, Foundation, and Requirements [In progress]*

ISO/IEC 18012-1:2004, *Information technology – Home Electronic System (HES) – Guidelines for product interoperability – Part 1: Introduction*

315 ISO/IEC 18012-2:2012, *Information Technology – Home Electronic System (HES) –*
316 *Guidelines for product interoperability – Part 2: Taxonomy and application interoperability*
317 *model*

318 ISO/IEC 18012-3, *Information technology – Home Electronic System (HES) – Guidelines for*
319 *product interoperability – Part 3: Lexicon [In progress]*

320 ISO/IEC 18012-4, *Information technology – Home Electronic System (HES) – Guidelines for*
321 *product interoperability–Event encoding*

322 ISO/IEC 15067-3:2012, *Information technology – Home electronic system (HES) application*
323 *model – Part 3: Model of a demand-response energy management system for HES*

324 **3 Terms, definitions, and abbreviated terms**

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

326 **3.1 Terms and definitions**

327 **3.1.1**
328 **application services**
329 *[Editors' note: text to be added]*

330 **3.1.2**
331 **foundation**
332 *[Editors' note: text to be added]*

333 **3.1.3**
334 **HES gateway**
335 *[Editors' note: text to be added]*

336 **3.1.4**
337 **Interface, service, and event encoding group**
338 **ISEE group**
339 group of interface modules, service modules and HES-CLME event encoding to support a
340 particular application or operation

341 **3.1.5**
342 **responsive appliance**
343 communicating appliance for which messages exchange control information and potentially
344 sensor information

345 *[Editors' note: definitions to be added as introduced]*

346 **3.2 Abbreviated terms**

347	CLME	common language messaging exchange
348	DER	distributed energy resource
349	EMA	energy management agent
350	EMMA	energy management and measurement architecture
351	HAN	home area network
352	HES	home electronic system
353	ISEE	interface (e.g., HAN and WAN interface modules), service (e.g., service
354		modules), and event encoding (e.g., HES-CLME)