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INTERNATIONAL STANDARD

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Information technology - Home Electronic System (HES) application model - Part 3-30: Energy management agent functional requirements and interfaces

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FOREWORD

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ISO/IEC 15067-3-30 has been prepared by subcommittee 25: Interconnection of information technology equipment, of ISO/IEC joint technical committee 1: Information technology. It is an International Standard.

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

Draft	Report on voting
JTC1-SC25/3203/FDIS	JTC1-SC25/3218/RVD

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

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

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1, and the ISO/IEC Directives, JTC 1 Supplement available at www.iec.ch/members_experts/refdocs and www.iso.org/directives.

A list of all parts of the ISO/IEC 15067 series, published under the general title *Information technology – Home Electronic System (HES) application model*, can be found on the IEC and ISO websites.

IMPORTANT – The "colour inside" logo on the cover page of this document 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

This document specifies energy management agent (EMA) functional requirements and interfaces for interconnected energy management agents in a house, an apartment complex, or a residential community with multiple EMAs. It supports energy management by facilitating interactions among EMAs, appliances, consumer electronics, distributed energy resources (DER) and electric vehicle (EV) chargers. These EMA functional requirements and interfaces complement the reference model for interconnected EMAs specified in ISO/IEC 15067-3-3. The EMA interfaces identify interactions and information exchanges for energy management applications. The goal of this document is to specify a framework for multiple EMAs to provide energy management co-operatively by using communication protocols that link devices participating in energy optimization, transactive energy (TE), and demand response (DR) programmes, subject to constraints such as a consumer's budget for energy or goals for reducing greenhouse gas emissions.

This document explains a high-level view of the EMA functional requirements and reference interfaces in energy environments beyond the traditional public utility. Such energy environments include energy supplies from DER and TE sources. DER encompasses supplies from wind turbines, solar panels, and other local power generators, plus storage equipment (stationary and mobile batteries). Also, the EMA can assist the prosumer (a consumer who also produces power) in buying or selling TE.

As specified in ISO/IEC 15067-3-3, the EMA can interact with other EMAs, smart appliances, DERs or other consumer products. Interacting EMA are anticipated to be important for apartment complexes with multiple apartments and possibly multiple houses or buildings on a campus. ISO/IEC 15067-3-3 accommodates an EMA per apartment, per building, per campus, and possibly a cloud-based EMA. Options for interconnecting EMAs to create an EMA framework (EMF) are specified.

This document and related standards accommodate flexible and efficient energy management by co-ordinating and optimizing energy consumption and generation within a residential community consisting of houses and apartments. The ISO/IEC 15067-3 series enables automated energy management including optimal load control for allocating energy consumption and generation among multiple products in a house or a small building. The co-ordination among products offers improved energy management applications and overall efficiency according to goals set by the occupants. Multiple EMAs organized according to this document will be especially useful as DER proliferates with fluctuating energy generation and storage.

INFORMATION TECHNOLOGY – HOME ELECTRONIC SYSTEM (HES) APPLICATION MODEL –

Part 3-30: Energy management agent functional requirements and interfaces

1 Scope

This document specifies functional requirements and reference interfaces for interconnected energy management agents (EMAs) based on the model for an EMA specified in ISO/IEC 15067-3 and the model for multiple interacting EMAs specified in ISO/IEC 15067-3-3. This specification supports energy management by facilitating interactions and information exchange among EMAs and appliances, consumer electronics, heating, ventilation, and air conditioning (HVAC) equipment, water heaters, distributed energy resources (DERs), electric vehicle (EV) chargers, and other loads supplied by public and local power sources in a house or an apartment complex. Local power sources can use DER, which can include, but are not limited to, wind turbines, solar panels, and storage (stationary and mobile). EMAs specified with these functions and interfaces can assist the consumer in responding to price-varying public power and buying or selling transactive energy (TE).

This document specifies framework methods for EMAs to co-ordinate the delivery of energy management applications, and the reference interfaces facilitate a communications protocol among interacting EMAs. These linked and interacting EMAs provide energy optimization and conservation within constraints such as a consumer's financial budget and goals for greenhouse gas reduction, while supporting programmes as diverse as TE and demand response (DR).

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 15067-3:2012, *Information technology – Home Electronic System (HES) application model – Part 3: Model of a demand-response energy management system for HES*

ISO/IEC 15067-3-3:2019, *Information technology – Home Electronic System (HES) application model – Part 3-3: Model of a system of interacting energy management agents (EMAs) for demand-response energy management*

3 Terms, definitions and abbreviated terms

3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO/IEC 15067-3:2012, ISO/IEC 15067-3-3:2019 and the following apply.

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

- IEC Electropedia: available at https://www.electropedia.org/
- ISO Online browsing platform: available at https://www.iso.org/obp

3.1.1
client EMA
cEMA
energy management agent (EMA) that acts as a client to another EMA

[SOURCE ISO/IEC 15067-3-3:2019, 3.1.1]

3.1.2
server EMA
sEMA
energy management agent (EMA) that acts as a server to other EMAs

[SOURCE ISO/IEC 15067-3-3:2019, 3.1.7]

3.2 Abbreviated terms

AI	artificial intelligence
AMI	advanced metering infrastructure
API	application programming interface
cEMA	client EMA
DER	distributed energy resources
DR	demand response
EMA	energy management agent
EMF	EMA framework
EV	electric vehicle
HAN	home area network
HES	home electronic system
HVAC	heating, ventilation, and air conditioning
MAS	multiple agent system
REST	representational state transfer
sEMA	server EMA
TE	transactive energy

4 Conformance

Implementations of an energy management system with multiple EMAs shall conform to one of the EMA configuration options in Clause 5 and to the functional requirements and reference interfaces specified in Clause 6.

5 Configuration of multiple energy management agents in a residential community

5.1 Overview

ISO/IEC 15067-3:2012 specifies the model of a generic energy management system and specifies the EMA for a house or a unit in an apartment complex. Communicating EMAs in an apartment building, a residential community house or a small building are introduced in ISO/IEC 15067-3-3:2019. These EMAs communicate with each other in an EMA framework (EMF) to optimize energy management among these houses and units (apartments). Figure 1 shows a generalized EMF configuration for houses in a residential community. The EMF configuration shown in Figure 1 is enabled by the EMAs in each house and the EMA serving the community, all acting co-operatively to provide energy management for each house and for the community. EMAs interface with DERs, EVs, and smart appliances (e.g. thermostat, dishwasher, air conditioner, and heat pump) to optimize energy management within constraints set by the consumer. Such constraints are personalized by the consumer and can include a cost budget, limits on greenhouse gas emissions and reduction in the carbon footprint of the house.

An EMF can also be integrated with a metering system as illustrated in Figure 1. Smart meters perform automated meter readings and communicate with an advanced metering infrastructure (AMI) of a utility or energy service provider. The AMI network shown in the network is separate from other networks because it is often proprietary to a meter manufacturer. Smart meters can provide utility and consumption data useful for EMAs to management energy within a home or apartment complex.

In some regions, customers with excess wind and solar power can sell the excess to the local utility. Some are paid the retail rate for energy; others are paid a special "feed-in tariff" rate. Such customers who also produce power are called "prosumers". As reported in ISO/IEC TR 15067-3-7 and ISO/IEC TR 15067-3-8, there is considerable research into the development of markets and technologies for prosumers to sell excess wind and solar power to neighbours via a local microgrid or the distribution grid. The process that includes a market and technologies for prosumers to sell and buy power among themselves, to an aggregator or a public utility is called transactive energy (TE).

TE is enabled by a local trading market for power with a bid-and-ask mechanism for power to be delivered now or at a specified future time. However, this is a constrained market because power must flow from source to load over wires that have capacity limits. Therefore, controls are needed to manage power flows on a local basis. The EMA could be programmed both for TE bidding and for managing power flows from the TE supplier to the TE customer's appliances, EVs, and storage devices. The EMAs can buy and sell energy to a local utility or to other prosumers (subject to local regulations), as described in ISO/IEC TR 15067-3-7 and ISO/IEC TR 15067-3-8.