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Definition of extended SGAM smart energy grid reference architecture model

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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DEFINITION OF EXTENDED SGAM SMART ENERGY GRID REFERENCE ARCHITECTURE MODEL

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SyCSmartEnergy/142/DTS	SyCSmartEnergy/160/RVDTS

Full information on the voting for the approval of this Systems Reference Deliverable 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.

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INTRODUCTION

The concept of Smart energy Grid Architecture Model (SGAM), introduced by the CEN-CENELEC-ETSI SG-CG (refer to [1][1], [2], [3]) and foundation of IEC TR 63097 [4], has already been disseminated widely as a well-known concept, but there was no official definition. And recently, interactions between Smart Grid systems and heat/gas systems are becoming increasingly necessary. Therefore, an official definition of SGAM and its expansion to potentially include heat/gas systems is needed.

This document aims at providing an official definition of SGAM, associated with a formal ontology described in a textual format as well as with code components. The work is conducted so that generic elements that could be used by different domains are separated from the specific application of the generic elements to the smart energy grid domain.

The SGAM is a three-dimensional architectural framework that can be used to model the exchange of information between different entities located within the smart energy arena. The three dimensions are domains, zones, and layers.

- Domains identify a set of roles associated with five different areas of the energy grid: bulk generation, transmission, distribution, distributed energy resources, and customer premises.
- Zones represent the six hierarchical levels of power system management: market, enterprise, operation, station, field, and process.
- Layers represent the five aspects of information exchanges: business objectives, functional processes, information models, communication protocols, and components.

The primary focus of the SGAM is on interoperability since the exchange of information is the key to the smart energy grid. However, the SGAM can be used for many different purposes involving interoperability, including:

- use cases, by identifying where the various roles, systems, and information exchanges take place within the three-dimensional SGAM structure;
- standards development, by assigning different types of information exchange standards to the areas that they are designed for, which can facilitate a better coordination between entities, solving potential overlaps/gaps;
- architectures, by identifying the portions of the three dimensions that are applicable to the architecture of interest;
- system design, by designating the different interactions between different systems within different domains at different layers.

[1] Numbers in square brackets refer to the Bibliography.

DEFINITION OF EXTENDED SGAM SMART ENERGY GRID REFERENCE ARCHITECTURE MODEL

1 Scope

This document, which is a Systems Reference Deliverable, defines the framework elements, associated ontology, and modelling methodology for designing the Smart energy Grid Reference Architecture using the Smart Grid Architecture Model (SGAM), with potential expansion to describe the interaction between the grid and heat/gas systems, and including easily understandable examples.

This document also provides a machine level representation of the concepts associated with the SGAM in the form of an ontology provided in the form of diagrams in Annex A, as well as in the form of a code component. Thus, this document is associated with a code component presented as a ZIP file package containing:

- a file describing the content of the package (IECManifest.xml);
- the OWL representation of the ontology of the concepts introduced in this document;
- The same content as the OWL content, but exposed as a series of HTML files, which any browser can open for easy reading.

Considering that such a code component is redistribuable (EULA license), and can also evolve, it is accessible to all actors of the supply chain through the IEC website at:
http://www.iec.ch/sycsmartenergy/supportingdocuments under the name *IEC_SRD_63200.OWL.2021A.Full.zip*.

The latest version/release of the document will be found in the future by selecting the file for the code component with the highest value for VersionStateInfo, e.g. *IEC_SRD_63200.OWL.{VersionStateInfo}.Full*.

Finally, compared to past publications related to the SGAM (mostly by CEN-CENELEC-ETSI CG-SEG), this document provides in addition:

- further refinement on main roles, to avoid possible confusions between them;
- extensions for supporting interfaces for other energies;
- a seamless and detailed integration with the IEC 62559 and IEC 62913 series;
- formal representations in UML and OWL ontology formats.

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.

IEC 62559-2:2015, *Use case methodology – Part 2: Definition of the templates for use cases, actor list and requirements list*

3 Terms, definitions and abbreviated terms

3.1 Terms and definitions

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