Recommendations for
smart grid standardization in Europe

Standards for Smart Grids

Extracted from the Final report of the CEN/CENELEC/ETSI
Joint Working Group on Standards for Smart Grids

EUROPEAN STANDARDS ORGANIZATIONS

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Foreword

The development of smart grids is essential for Europe's energy policy. In order to integrate large-scale renewable energy generation, sustain security and resilience of the networks and realise energy savings we need an expanded and modernised network that makes best use of all the intelligent technologies available. European standards for smart grids, smart meters and charging interfaces with electric vehicles are a prerequisite to allow our industry to invest in and make use of smart grids. We need them as soon as possible: the longer it takes, the more investments are delayed.

At the European Council of 4 February this year, the Heads of State invited the Member States, in liaison with European standards bodies and industry, to accelerate the work with a view to adopting technical standards for smart grids and meters by the end of 2012. As stressed in the Commission's Communication for the deployment of Smart Grids of 12 April, standardization of interfaces, the implementation of security by design and data privacy principles in relevant devices are key issues for the development of smart grids, metering and the interface with electric vehicles.

The European Commission's mandates to the European Standards Organizations for smart meter standards were issued in March 2009 and for electric vehicles standards in June 2010. Building on the consensus achieved among all stakeholders participating in the Smart Grids Task Force, the Commission issued a mandate for standardization of smart grids by the end of February 2011[1]. The standardization process for smart grids should moreover coordinate and benefit from the ongoing work on smart meters and on charging interfaces for electric vehicles. Thus, the reference architecture for smart grids in Europe and an essential set of standards is expected to be issued by the end of 2012.

This report is an excellent guide to identifying existing standards and the gaps still in place as well as to the work ahead of us to meet the mandate's objectives. Acknowledging the recommendations contained in the report as the product of close co-operation of all stakeholders jointly with the European Standards Organizations, I am also confident that future work towards their implementation will continue in the same collaborative and inclusive spirit.

I would like to thank all the participants involved in the execution of these mandates for their commitment to this work, and would like to emphasise the importance of a timely delivery of the work ahead.

Let us contribute to the smart grid standards that Europe needs so urgently.

Günther H. Oettinger
Commissioner for Energy

1 - M490 on 1 March 2011, http://ec.europa.eu/energy/gas_electricity/smartgrids/taskforce_en.htm.

Executive summary

Europe is committed to the 20-20-20 targets to reduce carbon emissions and to secure energy supply. Energy efficiency and renewable energy are seen as key to reach this goal. Both measures call for changes in our energy supply system leading to smart grids as key enablers for the required innovation. To promote this transformation the European Commission has taken a number of actions including a mandate on standardization.

Standardization of smart grids is not 'business as usual'. The huge number of stakeholders, the necessary speed, the many international activities and the still changing solutions make it a difficult task for the European Standards Organizations (ESOs). This report investigates the status of smart grids standardization in Europe. It does not duplicate the extensive work already done in other regions. Its main focus is the organization of standardization in Europe.

The present version of the report focuses on the smart electricity grid, keeping it aligned with the scope of the European Commission's Smart Grids Task Force Expert Groups 1, 2 and 3.

High level recommendations:

- **Use a top down approach**
  The different applications to be deployed over time need to fit together. This can only be assured by strong coordination.

- **Build up a flexible framework of standards**
  Market business models, players and technical solutions are still changing. A flexible model or architecture must be available to map services and use cases.

- **Agree on a European set of use cases**
  Establish a single repository of use cases to systematically identify existing and future standardization needs.

- **Align with international standards**
  Cooperate with international and relevant national smart grid standardization activities. Base European standards on existing international standards and promote European results to the international level.

- **Don't reinvent the wheel**
  Reuse existing mature standards whenever appropriate.

- **Adapt the organization and processes for standardization**
  Smart grids are a system issue rather than a product issue. The CEN/CENELEC/ETSI Joint Working Group will promote this approach in close collaboration and cooperation with the existing TCs and structures.

The aim of the report is to provide a strategic report which outlines the standardization requirements for implementing the European vision of smart grids, especially taking into account the initiatives by the Smart Grids Task Force of the European Commission. It provides an overview of standards, current activities, fields of action, international cooperation and strategic recommendations. After an introduction to the political and technical background of smart grids in Europe and the current standardization activities around the world, and a description of the scope of the report and the procedure followed in its development, the report goes on to state general recommendations addressed to the European Standards Organizations. The current status of standardization in cross-cutting and domain-specific topics is addressed in detail. The report concludes with the next steps to be taken.

In summary, the report identifies thus the necessary steps to be taken and proposes recommendations concerning standardization of smart grids. A prioritization of actions still needs to be performed and the content will be influenced continuously by external events. This is especially true for the standardization mandate. The content and spirit of the mandate need to be included in later versions of the report. It is therefore planned to revise this document regularly. It is now up to all of us to play an active part in the further implementation and development of standardization of smart grids in Europe in order to put the vision into practice. A large amount of standardization work has already been done and a vast set of important and mature standards is already in place. Smart grids implementations based on these standards can already start from this level and from the work already in progress. Reduction of the known gaps and overlaps is underway. In addition, longer term improvements are necessary to provide a coherent and future-safe framework and processes for standards development. The report addresses both aspects.

This paper presents an overview of recommendations for smart grid standardization in Europe. The complete report from which these recommendations are the summary is available from the web-sites of the European Standards Organizations:

- www.cen.eu/cen/Sectors/Sectors/UtilitiesAndEnergy/SmartGrids/Pages/default.aspx
- www.cenelec.eu/aboutcenelec/whatwedo/technologysectors/smartgrids.html
- www.etsi.org/website/Technologies/SmartGrids.aspx

Recommendations for smart grid standardization in Europe

1 | General recommendations

▶ G-1 Further development of the report

This report should be further developed with regard to the focal topics identified, in cooperation with the corresponding professional groups and stakeholders. Topics such as energy storage, security of supply and micro-grid may also be included.

▶ G-2 International standards as a basis for promoting EU industry

Standardization of smart grids must be based on existing international work, to avoid reinventing the wheel, to accommodate solutions which are already standardized and applied for practical purposes and to secure the interests of European manufactures who are operating globally. This document recognizes that work and therefore builds upon the globally recognized smart grid standards as identified in the report.

▶ G-3 Speed of implementation – reuse existing systems

There are already a number of quite advanced initiatives around the world which are described in the report. In order to secure European interests in the implementation in Europe and around the world existing mature domain communication systems should be used. The ESOs should further standardize necessary interfaces and product requirements and must avoid standardizing applications and solutions. The focus must be on standard development according to the R&D and deployment priorities of the EU given in the Smart Grids Task Force reports, the ETP and the SDD.

▶ G-4 Concentrate on future proof standardization

Smart grids is a highly dynamic technical field. Standards must therefore be generic and open to include future developments from R&D and pilot projects. It is therefore recommended to concentrate on generic standards which flexibly mirror market needs and technological development.

▶ G-5 Build up a SINGLE repository for smart grid use cases

The descriptions of functionalities / use cases represent an important basis for the further work, including that on standardization. It is therefore recommended to collect use cases as a base to start detail work on standards. Supply this repository with at least

- the M/441 set of use cases,
- active liaisons with all European smart grid projects,
- the EG1 to EG3 reports of the Smart Grids Task Force of the European Commission, and
- experience from of the national committees.

Check if the re-use of use cases coming from other countries or regions may lead to single worldwide use-case definition.

Define the methodologies: templates, classification, organization, harmonization of use cases, publication, etc.

▶ G-6 Adapt standardization processes

Define the processes needed to match the lack of maturity of many smart grid applications. As stated in the EG1 report, «smart grids deployment will be a continuous learning process» and standardization should propose a clear set of processes to cope with this learning process. For instance, use an electronic form of communicating standards in order to enable seamless integration of standard data models. Define open and transparent quality processes attached to smart grid standards, covering the whole life cycle of such standards, including how to collect issues, to treat/fix issues, and then to validate and test.

▶ G-7 - Relationship between legislative requirements and standardization

A proven concept, described as New Approach and further developed as New Legislative Framework (NLF), has been the legislative definition of essential requirements. Related to the legislative document (e.g. directive or regulation), harmonized standards from the European Standards Organizations (ESOs) describe further technical details. Following the harmonized standards it can be assumed that the essential requirements of the legislative document are fulfilled (presumption of conformity).

For the system approach of the smart grid no essential requirements from legislation are currently available. The relationship between the standards produced by the ESOs under the standardization mandate and future legislative initiatives at the European level needs further consideration in due course, once the latter are defined.

2 | Recommendations to the European Standards Organizations (ESOs)

▶ O-1 Extend timeframe and scope of JWG Smart Grids

The JWG scope and duration should be adapted to the wider needs of further tasks, coordination of responses to an EC mandate and a further investigation of the ever changing environment in the smart grids area.

▶ O-2 Marketing of ESOs work on smart grids

ESOs must highlight their work on the markets, and promote the work already done on international and various regional levels. This is necessary to maintain the high level of influence on international standardization and therefore on solutions. Funding of the external representation of the ESOs should be investigated as international activities indicate that the roles of the US and Asia are growing due to high public funding of the respective standards organizations. Although this might conflict with the traditional role of European standardization the short time frame for action in order to participate within the ongoing debate at international level and the need to standardize in areas where R&D still is needed, public funding might be justified for some stakeholder groups like R&D institutes or SMEs. Any solution should be based on the co-operation with national standards organizations and their experts and expertise.

▶ O-3 Mandates in relation to smart grids

Concerning the different mandates that are or will be issued in the context of smart grids, consistency and coherence must be ensured by the Technical Boards of CEN and CENELEC and by the ETSI Board by taking account of and building on the results of the work carried out already as far as possible.

3 | Standardization recommendations regarding terminology, object identification and classification

▶ Term-1 : Harmonization of glossaries

Establish a process for harmonizing smart grid vocabulary over different domains.

▶ PPC-1 Electronic Data models

Align glossaries as much as possible with Electronic Data Models (TC 57/SC 3D).

4 | Recommendations regarding a reference architecture

▶ Ref-1: Conceptual Model

Continue work on a Conceptual Model which describes the major stakeholders and their interactions taking into account the work of the Smart Grids Task Force.

▶ Ref-2: Functional Architecture

Develop, possibly based on the IEC/TC 57 model, a Functional Architecture that takes into account all the generic, global aspects of smart grids as well as all the European specificities, in particular those outlined in the Conceptual Model. This model must accommodate the harmonization of potentially different architectures produced during the definition of several smart grid applications.

NOTE - This model should be fed back to global standards developing organizations

▶ Ref-3: Communication Architecture

Develop a Communication Architecture to take into account the large variety of network and connectivity scenarios involving communications interface.

▶ Ref-4: Security Architecture

Expand the work done in the European Commission Smart Grids Task Force, in particular the EG2 Report, to create a security architecture also taking into account a conformity assessment approach whenever applicable.

▶ Ref-5: Consistent Information Model

Ensure that the Information Architecture is both relying on precisely identified standards and also that the consistency of Information Model is guaranteed by an appropriate mechanism for re-aligning separately developed (and possibly diverging) models.

▶ Ref-6: Create a Reference Architecture team within the Smart Grid Joint Working Group

The role of this team would be to set up the scope and work methods for the work associated with the Reference Architecture, and make sure that at least some of the major views (Conceptual Model, Functional, Communication and Security Architecture) are in line with the deadlines of the Standardization Mandate.

5 | Standardization recommendations regarding system aspects

▶ Sys-1: Adapt ESOs to handle top-down system approaches

Set up adequate bodies and sustainable processes to manage smart grid top-down system approaches and the relationship with the existing TCs in charge of developing standards. These processes should cover the overall life cycle of standards from upstream requirement definitions, down to interoperability testing. Provide an incremental way of proceeding and maximum flexibility for addressing unknown future usages.

Establish the conditions for managing European smart grid use cases in a consistent way: shared rules, shared template, shared list of actors …while keeping alignment with the IEC SG3 Smart Grid Use Cases Initiative.

As soon as possible, feed the TC 8X with these top-down smart grid use cases, to be taken into account by ad hoc standardization bodies. Ask the European projects to feed the standardization process with European use cases and elaborate the set of European smart grid use cases.

▶ Sys-2: Initiate 'Smart Grid Data model' activity

Initiate activity on a 'Smart Grid Data model' within a group reporting to JWG.

▶ Sys-3: Initiate 'Smart Grid System Management and security' activity

Initiate "Smart Grid System Management and security" activity within a group reporting to the JWG.

NOTE - Information security aspects are addressed in a set of dedicated recommendations.

▶ Sys-4: Check comprehensiveness of standards towards interoperability

Check the coverage of selected standards against semantic, behaviour, conformance testing and fill gaps when needed.

▶ Sys-5: Systematically address system interoperability

Pave the way for implementing step-wise approach to interoperability.

▶ Sys-6: Create quality process for smart grid standards

Define open and transparent quality processes attached to identified smart grid standards covering their whole life cycle, including answers on how to collect issues, to treat/fix issues, to take into account new market needs and then to validate and test, including the compatibility with former releases.

6 | Standardization recommendations regarding data communication interfaces

▶ Com-1: Further develop power/distribution line communication

Follow the recommendations of the SMCG Technical Report, which already contains a work plan for CENELEC/TC 13 to integrate different protocols with the existing standards.

Most EMC guidelines and standards start at frequencies above 150 kHz, which could lead to interference between domestic appliances and PLC devices operating below this range. For frequencies lower than 150 kHz the EMC guidelines/regulations should be developed. For PLC communication the use of the frequency range up to 540 kHz should be specified, subject to protecting existing users of these frequencies for radio communication and other purposes.

For broadband PLC we recommend that where applicable and no alternative standard inside ETSI/CEN/CENELEC can be found the IEEE P1901 should be taken into account.

Work with the ETSI PLT TC to evaluate the use of ITU-T PLC Narrow band Orthogonal frequency-division multiplexing (OFDM) G.9955.

▶ Com-2: Harmonize activities on data transport technologies

Developments made by ETSI and the data communication related IEC and CEN/CENELEC activities within IEC and CEN/CENELEC should be mutually coordinated. The service capabilities defined by ETSI should be integrated with the smart grid related application protocols mentioned in the data communication interfaces section of the report.

▶ Com-3: Align the work on intra-domain standards between the AMI and other Smart Grid subsystems

Further work on Use Cases and standards regarding the interfaces between the AMI and other smart grid applications (such as EV charging and DER metering) should be aligned under the new Smart Grid Mandate, in cooperation with the SMCG.

7 | Standardization recommendations regarding smart grid information security

▶ ISec-1 Ensure system level information security requirements are covered in all relevant standards

Fast incorporation of system level information security requirements (for all data protection classes and information security levels) into

I. product, solution and service standards of all 'sphere of action' domains;

II. 'sphere of action' domain-specific 'organizational standards' for market roles participating in smart grids, according to their responsibilities, and functions provided.

Ensure consistency between those and sustain 'state of the art' SGIS and DPP by synchronizing all standards with changing guidance on system level requirements for SGIS and DPP.

▶ ISec-2 Smart grid functions and use cases require binding to SGIS and DPP requirements

For several data protection classes (SG-DPC) legal requirements exist and require the appropriation of the SG-DPC, i.e. personal data, control data, logging. Therefore, the concept of SGIS is to provide the enablement for bonds between

- the use cases which describe the intended utilization of data as well as
- the usage rights based on obligations and limits of its usage and its required specific information security level (who, when, why, what data is generated, processed, stored, transmitted, erased) and on justification derived from contractual/regulatory frameworks).

This will need a definition for all specific SG-DPCs and SGIS-SLs. The concept is to obligate the use case writing experts to identify ALL data models used in the function or use case (these describe the data usage and justification of the specific usage). The data model repository will need to include the specific data protection classes (SG-DPCs) for every single UML data model. The information security experts will need to specify the appropriate information security level requirement (SGIS-SL) for each single SG-DPC.

It is recommended that ESOs provide interlinked repositories to achieve the required bonds.

▶ ISec-3 SGIS-SL and SG-DPP upgrade and synchronization requirements

There are 2 distinct independent areas with changing dynamics along the pathway to implementation of smart grids

- Innovation dynamics in smart grid function and use case definitions – describing the changing 'Operational Model' of smart grids and the data models used
- and in dynamics in SGIS and DPP evolving the harmonized set of 'system level' SGIS and DPP impacting the evolution of the SGIS-SLs and SG-DPCs.

The ESOs need to provide a sustainable mechanism to update and synchronize the bonds of data models used by functions and use cases to the SG-DPCs and their SG-ISL requirements. This is required to link and synchronize use case and data model repositories as well as derived standards for smart grid system components (products, solutions, services) and organizational standards which need to be in sync with changing system requirements for the 'smart grid information security' (SGIS) and data protection/privacy (DPP).

▶ ISec-4 ESO to provide IT Tools to support SGIS and DPP modelling and repositories for SG-ISL/SG-DPC

As mentioned above (ISec-3) there are two distinct evolutionary areas – the smart grid operation model and the SGIS model, with different 'innovation dynamics' - both areas need to be supported by tools that allow experts in both areas to define the content and models and that interlink, each with the capability to inherit changes from the other area. The set of tools and repositories are unique to the area. Therefore the tools for modeling SGIS are different. The need for tools and repositories required in the area of the smart grid operation model – to capture functions, use case scenarios and use cases and all data models with their specific classifications are described in another section of this report.

The ESOs should also provide tools specifically for the area of SGIS, DPP and the repositories for SGIS-SL and SG-DPC to experts and communities in the area of information security to assist them in modelling SGIS and DPP and maintaining and upgrading repositories for the 5 information security levels (SGIS-SL), and the repositories for smart grid data protection classes (SG-DPC). The tools provided to model SGIS, DPP system level and on the actor level (products, solutions, services and people, roles or organizations) and the repositories for SGIS-SL and SG-DPC need to be interlinked.

As mentioned above (ISec-3) there is the need to keep the two areas synchronized at all times. Therefore, the tools to be provided for both areas also need to permit synchronizing and binding, i.e. the repositories containing all SG-DPCs and their specific required/linked SGIS-SLs to the repositories containing the functions/use cases and their specific data models (to allow binding to the SG-DPC specified for the single data model).

8 Standardization recommendations regarding dependability and functional safety

▶ Dep-1 Check relevance of existing methodologies to smart grids

Ask TCs (56 and 65A) whether their methodologies (with regard to Dependability and Functional safety) are well-suited/applicable to smart grids.

Standardization recommendations regarding EMC and power quality

▶ EMC-1 Review existing standards

CENELEC TC 210 and Product Committees to review existing standards concerning an appropriate modification for closing gaps in order to also ensure EMC in the frequency ranges from 2 kHz to 150 kHz (in practice 2-9 kHz and 9-150 kHz).

NOTE - Technical input in this domain can be found in several reports/publications, such as the CENELEC SC 205A Study report on electromagnetic interference between electrical equipment/systems in the frequency range below 150 kHz, (SC205A/Sec0260/R, April 2010). Nevertheless, further studies are probably necessary before a complete set of standards can be available.

Furthermore, the following actions of the standardization communities are suggested to support low frequency EMC/power quality in the context of smart grids.

▶ EMC-2 Review EMC and Power Quality levels

Review electromagnetic compatibility levels and/or characteristics of voltage at interfaces for all standard voltage levels of public electrical power networks, and define the associated operating conditions in the context of the smart grids.

▶ EMC-3 Consider distorting current emissions from DER equipment

Standardize how to give a limitation to the distorting current emission by DER equipment and to fairly allocate the ability of networks to absorb distorting current emissions among present and possibly forthcoming connected equipment, including Distributed Generation at sites in networks. Connected equipment may well be other networks. The work is recommended to originate from documents IEC TR 61000-3-6, IEC TR 61000-3-7, IEC TR 61000-3-13 and future IEC TR 61000-3-14.

9 | Standardization recommendations regarding generation

▶ Gen-1 Harmonized glossary, semantic & modelling between back-office applications (CIM) and field applications (IEC 61850)

Provide experts to IEC/TC 57 body to boost CIM/IEC 61850 harmonization planning, fix this issue ASAP and establish clear messages to the market. Support electronic form of IEC 61850 data model at IEC level based on UML language.

NOTE - IEC 61968 and IEC 61970 standards provide models of transmission, distribution systems and energy markets, as well as partial models of power generation, models known as the CIM (Common Information Model), structure and semantics for integrating a variety of back-office applications.

IEC 61850 standard provides a model for substation automation system and renewable energy resources (PV, hydro & wind and other), a basis for field equipment communications, including semantics, and encompasses real-time operations as well as non-operational data, such as condition monitoring.

▶ Gen-2 Harmonization between IEC 62056-XX (DLMS/COSEM) data model and IEC 61850/CIM

Take the lead on this IEC 62056-XX (DLMS/COSEM) data model harmonization with CIM/IEC 61850, within the IEC body (through CENELEC/TC 57 and CENELEC/TC 13).

▶ Gen-3 Extended field data modelling standard (part of IEC 61850) to support demandresponse, DER and VPP & Extended CIM to model more accurately Generation Fleet Management Applications in the case of Bulk Generation, and to integrate DER and VPPs

Clearly express and formalize to CENELEC/TC 8X the selected use cases which the European smart grids have to support and ensure IEC TC 57/WG 17 body (through CENELEC/TC 57) will provide expected answers in IEC 61850 data modelling regarding: Demand response for generators, for ancillary services, including VPPs and aggregators. Support TC 57/WG 13 initiatives to define use cases and modelling (such as AI715).

▶ Gen-4 Standard for electrical connection and installation rules to ensure energy availability and security, in the presence of a high ratio of DER

Harmonize electrical connection and installation rules within Europe, down to all levels of connection of DER.

▶ Gen-5 Standard to allow all connected generators associated in VPPs to participate to new ways of operating grid

Adapt installation rules of DER to allow new ways of operating grid such as microgrid (TC 64 and TC 8X).

More specifically, TC 64 should develop new requirements and adapt existing installation rules within the HD 60364 to cover DER needs.

10 | Standardization recommendations regarding transmission

▶ T1 – HVDC grid architecture

With the development of off-shore grids, there is a need for coordination, coherence and interoperability for equipment (converters, circuit-breakers, protection…) as well as for grid topology (grid design, voltage level, grid code,…) in the HVDC domain. The ESO standardization should take into account the work done in the German committee context.

▶ T2 – Smart assets

The ongoing IEC 61850-90-3 work, devoted to condition monitoring in the power energy domain, should be encouraged. The present standard and protocol for communication in substations should involve communication and relevant data models, whereas the relevant products Technical Committees have to standardize the methods and the devices needed for on-line monitoring.

Therefore, it is recommended that the ongoing IEC standard involves on the one hand the experts on equipment to monitor for the technical aspects and on the other hand representatives of users in order to assess the condition values.

▶ T3 – Offshore equipment

A review of the existing standards for transmission equipment is required in order to check that the special requirements for off-shore installations are properly covered. Otherwise, standards should be adapted.

These tasks should be notably performed by TC 14 (transformers), TC 17 (switchgear), TC 38 (instrument measurement) and TC 20 (underground cable).

11 | Standardization recommendations regarding distribution

▶ Dis-1: Feeder and Advanced Distribution Automation

Develop a standard that supports feeder automation (at CEN/CENELEC), and Advanced Distribution Automation.

▶ Dis-2: Use CIM (see also Gen-1)

Give high priority to the works needed in the area of harmonization of CIM /IEC 61850.

▶ Dis-3: Seamless communication between control centre and substation

Support international work in order to provide seamless communication between control centres and sub-stations based on 61850.

▶ Dis-4: Develop cybersecurity around IEC 62351

Work on a standard for cybersecurity as long as intensive public communication services (from Telecom Operators) will be used in distribution, enhance IEC 62351 in this area.

▶ Dis-5: Auxiliary power systems standardization

Develop standardization for auxiliary power systems (low voltage DC networks): AC/DC converters, DC management systems, DC protection.

▶ Dis-6: Integrate condition monitoring capabilities

Condition monitoring of components of substations or of lines provides technical information useful for optimized loading and helps to increase the lifetime of the distribution assets. IEC 61850, the present standard and protocol for communication in substations, should involve communication as far as the sensors needed for on-line monitoring. Ongoing work in TC 57: IEC 61850-90-3 (TR).

▶ Dis-7: Standards for Medium Voltage (MV) lines

Develop a set of standards covering V and I sensors, switching equipment (definition, and modelling) and fault detectors (definition, and modelling) for Medium Voltage lines (overhead and underground).

12 | Standardization recommendations regarding smart metering

▶ SM 1:

Currently various standards or extensions of existing standards are being developed to cover the exchange of metering data. Examples are:

- EN 62056 Electricity metering – Data exchange for meter reading, tariff and load control;
- EN 13757-1: 2002: Communication systems for meters and remote reading of meters;
- IEC 61968-9: System Interfaces for Distribution Management – Part 9: Interface Standard for Meter Reading and Control.

While harmonization of EN 62056 and EN 13757 is already being undertaken, some standardization initiatives go beyond the scope of M/441. A harmonization of standards more generally in this area is necessary to prevent further development of different (and competing) standards for the same purpose.

▶ SM 2:

Smart metering, building/home automation and electric vehicles are envisaged as elements in smart electricity grids. It is recommended that CEN/CENELEC/ETSI consider the use cases involving these elements and take care in their standardization work in these areas to ensure the needs and applications of smart grids are addressed in a harmonized fashion.

▶ SM 3:

Specifically to assist the development of proposals for possible link technologies in relation to smart grids and e-Mobility, it is recommended that CEN/CENELEC/ETSI should jointly undertake an investigation of the interfaces required insofar as they are not currently being addressed within the M/441 mandate. The ESOs should propose where standardization in these areas is necessary, taking care to ensure harmonization with existing metering models and other relevant standardization initiatives.

13 | Standardization recommendations regarding industry

▶ Ind-1: Tariff information

On-site energy management systems should be able to spread tariff information down to the load. We recommend extending the IEC 61850 model (the most common backbone system for EMS) to support tariff-related information.

▶ Ind-2: DR information

The demand response mechanism is not considered yet to support network ancillary services. We recommend extending the IEC 61850 model (DER) and other DR information channels to support ancillary services participation.

▶ Ind-3: Smart Meter and building system interface

In their work on data exchange between the smart meter and the building management system, the European Standards Organizations should ensure coordination between CEN/TC 247 and TC 13.

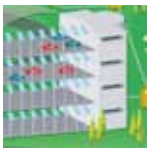
▶ Ind-4: Harmonized data model for industry and power grid

Too many data models already exist without mapping between them. We recommend harmonizing the data model related to energy management between Industry and Electricity (EN 61158, EN 61850).This work should be coordinated between CLC/TC 205, TC 65 and TC 57.

▶ Ind-5: Electrical installation allowing for DER integration

The usage of distributed energy resources as part of electrical installations and part of micro grids for industry raises new safety and protection issues. The multi-sources aspect is not covered by current installation rules. We recommend TC 64 to work on new installation rules for safety aspects and TC 8 or TC 99X to work on common rules for grid protection. TC 64 should develop a dedicated part within the HD 60364 to cover this need, keeping in mind that all national wiring rules through European countries are based on the HD 60364.

14 | Standardization recommendations regarding home and building



▶ HB-1: Separate realization from standards description

The use cases described above interface with the field of smart metering, but have to be logically separated. In standardization, there are arguments for distinguishing meter gateways from energy management gateways considering both applications as two logical blocks, since both fields are driven by different kinds of interests and innovation speeds. Competition is likely to result in different devices and technologies combining logical applications defined by standardization. In order to be open for such market development and for innovation, standardization should not define the device but the logical functions, data and interfaces in case these are needed for communication between different market roles or devices.

▶ HB-2: Unified language for tariff information

A unified language (a kind of common semantic layer above the existing technologies) has to be defined to communicate demand response related elements (e.g. an incentive like a new price / tariff). A Europe-wide or even worldwide unified data model for these aspects would be favourable considering the global market for smart appliances, devices and automation systems. For that purpose, data models/profiles have to be developed from the use cases. A multi-stakeholder committee considering the different domains and ESOs involved should be assigned this task of considering ongoing initiatives (from research, industry and standardization).

This approach can succeed only by broad introduction including existing standard technologies. Therefore, the unified language must be mapped onto the communication standards lying below. These “lower standards” should support this mapping mechanism which is not the case today.

15 | Standardization recommendations regarding demand response applications

▶ DR-1 Create DR task force

Create a single DR task force at CEN/CENELEC/ETSI level encompassing the adaptation of DR signals to manage DER and electric vehicle charging issues. Consider other countries’ experiences and standards (OpenADR alliance, OASIS work in eMIX and Energy Interop committees, E-Energy…).

Close coordination with the IEC/ISO and ETSI ITS standardization bodies for communication exchange with the EV.

▶ DR-2 Avoid European mandates overlapping

Define clear interface and responsibilities between the smart grids mandate, the smart metering mandate and the EV mandate and associated standardization bodies (part of smart grids mandate). Ensure interoperability between the different standards.

▶ DR-3: Complement Data Model for DR signals

Include pricing signals, DR signals and DR process interfaces into CIM, COSEM and IEC 61850.

16 | Standardization recommendations regarding markets and actors

▶ Mkt-1 Defined actors and roles as the basis of smart grid use cases

Standardization should play a role also in other areas where technical enforcement of market decisions by regulators or private sector actors is needed. Moreover, Standards Organizations have to provide the needed flexibility to accommodate the increasing variety of business models. These needs must be based on an agreed set of use cases to be developed and maintained over time. All of those use cases should be based on the described actors and roles.

▶ Mkt-2 Market communication

One of the particularly important areas of ICT standardization concerns market communication standards like EDIFACT, etc. and their capability to provide the services and functionalities. Besides being of general interest to standardization bodies and all other stakeholders, this issue is of utmost interest to all market players (suppliers, generators, traders, etc.) and also network operators, as it ensures a uniform and efficient exchange of data and information in the market. It is the standardization bodies for electricity and the ICT sector together who will need to review and identify all the required improvements and further developments in this area.

Abbreviations and acronyms

AMI	advanced metering infrastructure
AC	alternating current
CEN	European Committee for Standardization
CENELEC	European Committee for Electrotechnical Standardization
CIM	common information model
COSEM	companion specification for energy metering (See IEC 62056 - xx)
DER	distributed energy resources
DC	direct current
DLMS	Device Language Message Specification (IEC 62056)
DLMS/COSEM	see IEC 62056 series
DR	demand response
DPP	data protection / privacy
EDIFACT	Electronic Data Interchange For Administration, Commerce and Transport
EG	expert group (of the European Commission Smart Grid Task Force)
EMC	electromagnetic compatibility
eMIX	energy Market Information Exchange
EMS	energy management system
ESO	European Standards Organizations (CEN, CENELEC and ETSI)
ETP	European Technology Platform
ETSI	European Telecommunications Standards Institute
EU	European Union
EV	electric vehicle
HVDC	high voltage direct current
JWG	Joint Working Group (of CEN, CENELEC and ETSI on standards for smart grids)
I	Eletrical current intensity (from French *intensité de courant*)
IEC	International Electrotechnical Commission
IEC SG3	IEC Strategic Group 3 (on smart grid)
IEEE	Institute of Electrical and Electronics Engineers
ISO	International Organization for Standardization
ITS	intelligent transport systems
ITU	International Telecommunication Union
ITU-T	ITU's Telecommunication standardization sector (ITU-T)
M/441	standardization mandate on smart metering, issued by the European Commission
PLC	power line communications
OASIS	Organization for the Advancement of Structured Information Standards
OpenADR	open Automated Demand Response
PLT	power line telecommunications
R&D	research & development
RES	renewable energy sources
SC	sub-committee
SDD	strategic deployment document
SGIS	smart grid information security
SGIS-SL	SGIS – security level
SG-DPC	smart grid data protection classes
SG-ISL	smart grid information security level
SMCG	Smart Metering Coordination Group (of CEN, CENELEC and ETSI)
SME	small and medium sized enterprises
TC	Technical Committee (in CEN, CENELEC, ETSI, ISO or IEC)
TR	Technical Report (in CEN, CENELEC, ETSI or IEC)
UML	unified modelling language
V	Voltage
VPP	virtual power plant

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