EUROPEAN COMMISSION
DIRECTORATE-GENERAL FOR ENERGY

Directorate B - Security of supply, Energy markets & Networks
B.2 - Electricity & Gas

Brussels 1st March 2011
M/490 EN

Smart Grid Mandate

Standardization Mandate to European Standardisation Organisations (ESOs) to support European Smart Grid deployment

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Title

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1 Scope & Objectives

The scope of "Smart Grid" for the purpose of this mandate is as defined in the Task Force for the implementation of Smart Grids into the European internal market (hereafter *the Smart Grids Task Force*). [1]

The objective of this mandate is to develop or update a set of consistent standards within a common European framework that integrating a variety of digital computing and communication technologies and electrical architectures, and associated processes and services, that will achieve interoperability and will enable or facilitate the implementation in Europe of the different high level Smart Grid services[2] and functionalities as defined by the Smart Grid Task Force that will be flexible enough to accommodate future developments. Building, Industry, Appliances and Home automation are out of the scope of this mandate; however, their interfaces with the Smart Grid and related services have to be treated under this mandate.

It will answer the technical and organisational needs for sustainable "state of the art" Smart Grid Information Security (SGIS), Data protection and privacy (DPP), enabling the collection, utilisation, processing, storage, transmission and erasure of all information to be protected for all participating actors. This will enable smart grid services through a Smart Grid information and communication system that is inherently secure by design within the critical infrastructure of transmission and distribution networks, as well as within the connected properties (buildings, charging station – to the final nodes). This should be done in a way that is compatible with all relevant legal requirements, i.e. consumer data protection and privacy rights, metrology and daily business operations, and that is ensuring that rights of all consumers, including the vulnerable ones, are protected.

This mandated work will be co-ordinated with the outcomes of the existing mandates M/441 and M/468 to ensure a coherent standardisation framework (a bi-directional process).

This should also apply to any forthcoming mandate on other Smart Grid applications, which will also have to fit in the general framework delivered by the mandate.

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[1] A Smart Grid is an electricity network that can cost efficiently integrate the behaviour and actions of all users connected to it – generators, consumers and those that do both – in order to ensure economically efficient, sustainable power system with low losses and high levels of quality and security of supply and safety.

[2] The 6 high level services the Smart Grids Task Force defined are :

- Enabling the network to integrate users with new requirements
- Enhancing efficiency in day-to-day grid operation
- Ensuring network security, system control and quality of supply
- Enabling better planning of future network investment
- Improving market functioning and customer service
- Enabling and encouraging stronger and more direct involvement of consumers in their energy usage and management

The deliverables of this mandate must however allow for differences between different utility markets, regulations, and to this extent, be neutral as far as possible as to the specific technology or mechanisms that must be implemented.

1.1 Background

Smart Grids have an essential role in the process of transforming the functionality of the present electricity supply system so that they are able to provide a user-oriented service, supporting the achievement of the 20/20/20 targets:

- A reduction in EU greenhouse gas emission of at least 20% below 1990 levels;
- 20% of EU energy consumption to come from renewable resources;
- A 20% reduction in primary energy use compared with projected levels, to be achieved by improving energy efficiency;

and guaranteeing high security, quality and economic efficiency of electricity supply in an open market environment.

Although the third legislative Energy Package refers to the smart electricity grid specifically, however, it can be assumed that the same over arching privacy and security standards developed under this mandate could be applied to other utility metering data, as the consequences of incorrect data management could be assumed to be the same.

As electricity generation and network infrastructures are investments with long-term returns, they require a stable framework. In order to achieve the European and national energy policy objectives, a new global approach in the generation, transmission, distribution, metering, supply, storage and consumption of energy is necessary. Massive renewable integration and energy storage technologies will have to be deployed. Energy efficiency will have to be a general driving vector, demand will become an active player within the electrical system and the increasing electrification of transport (E-mobility or Electric Vehicles) will be a challenge.

Renewable generation will increasingly affect electricity networks. In particular, large wind farms (mainly offshore) will be connected to transmission networks; in addition, many distributed generation units, mainly fed by renewable energy sources (photovoltaic, small wind, biomasses) and/or CHP will be integrated into distribution networks, both at Medium Voltage and Low Voltage levels.

The whole electrical system will have to develop in the most efficient way to address the new challenges and needs of its users. The future scenarios are based on the development of a sustainable energy model where the carbon emissions will have to drastically decrease, with massive renewable energy integration.

1.2 Justification of objectives

The Smart Grid Task Force has identified very strong requirements for inter-operation of a large variety of domains (such as Grid operation, Grid automation, Distributed Energy resources management, Industry automation, Building and Home automation, Smart metering) while insuring a high level of consistency, security, data protection and privacy, and cost efficiency.

All these domains and their integration into a single interoperable system are also at different steps in maturity.

A secure and robust energy network is essential for the continuous improvement and industrious operation of the European energy markets. This will only be possible if the associated information and communication networks are secure and robust. It is also essential to maintain data and system security and to respect the rights of end consumers as well as the fundamental rights and freedoms of natural persons.

As stated above, the scope of Smart Grids is large; thus the risk is that too many standardisation bodies work on this issue, providing inconsistent sets of technical specifications, causing non-interoperability of equipment and applications and that the priorities will not be precisely defined.

The challenge of Smart Grids deployment will require changes to existing standards, industry rules and processes.

This mandate is to address such a challenge in the field of standardisation.

The expected long term duration of Smart Grid deployment suggests the need for a framework that is:

- Comprehensive and integrated enough to embrace the whole variety of Smart Grid actors and ensure communications between them
- In-depth enough to guarantee interoperability of Smart Grids from basic connectivity to complex distributed business applications, including a unified set of definitions so that all Members States have a common understanding of the various components of the Smart Grid.
- Flexible and fast enough to take advantage of the existing telecommunications infrastructure and services as well as the emergence of new technologies while enhancing competitiveness of the markets
- Flexible enough to accommodate some differences between EU Member States approaches to Smart Grids deployment

The value of such a framework will also be to foster and develop convergence of standards.

1.3 Relevant legal basis and instruments

Here is a non exhaustive list of legal inputs and instruments considered for this mandate at the time of publication:

- Directive 2004/22/EC on measuring instruments (MID);
- Standardisation Mandate M/374 of 20th October 2005 as base for developing standards for utility meters;
- Directive 2006/32/EC on energy end-use efficiency and energy services
- Directive 2004/8/EC for the promotion of cogeneration in the internal energy market
- Renewables Directive (2009/28/EC, Art16)
- Directives 2009/72/EC and 2009/73/EC (‘Third Energy Package’)
- Standardization Mandate M/441 of 12th March 2009 on development of an open architecture for utility meters

- Standardization Mandate M/468 of 29th June 2010 concerning the charging of Electric vehicle
- European Convention for the Protection of Human Rights and Fundamental Freedoms (ECHR)
- The Treaty on European Union (TEU, art. 6)
- Data Protection Directive (Directive 95/46/EC)
- Directive 2002/58/EC of the European Parliament and of the Council of 12 July 2002 concerning the processing of personal data and the protection of privacy in the electronic communications sector (Directive on privacy and electronic communications) as amended by Directive 2009/136/EC (November 25, 2009)
- Data Retention Directive, (Directive 2006/24/EC) – (telecommunications data)
- Directive on a Community framework for electronic signatures (1999/93/EC December 13, 1999)
- Regulation (EC) No 2006/2004 on cooperation between national authorities responsible for the enforcement of consumer protection law
- Directive 2004/108/EC on Electromagnetic Compatibility
- Directive 1999/5/EC on Radio and Telecommunications Terminal Equipment
- Communication COM (2010)245 on a Digital Agenda for Europe

N.B: Though building on the EU Acquis Communautaire, this mandate is designed to be, so far as is possible, technology and legislation neutral, such that future changes in technologies and legislation should not detract from its relevance.

2 Description of mandated work

CEN, CENELEC, and ETSI are requested to develop a framework to enable European Standardisation Organisations to perform continuous standard enhancement and development in the field of Smart Grids, while maintaining transverse consistency and promote continuous innovation. The expected framework will consist of the following deliverables:

1. A technical reference architecture, which will represent the functional information data flows between the main domains and integrate many systems and subsystems architectures.
2. A set of consistent standards, which will support the information exchange (communication protocols and data models) and the integration of all users into the electric system operation.
3. Sustainable standardization processes and collaborative tools to enable stakeholder interactions, to improve the two above and adapt them to new requirements based on gap analysis, while ensuring the fit to high level system constraints such as interoperability, security, and privacy, etc.

This framework will build on the Smart Grid Task Force reports from Expert Group 1 (EG1, especially Chap 11), EG2 and EG3 as main inputs, as well as already existing material delivered through other mandates such as the M/441 and M/468.

Specifically regarding information security and data privacy, standards will be developed and enhanced in order to encompass an agreed set of harmonized high level requirements as proposed by the Smart Grid Task Force.

Further details are in Annex A of this mandate.

If or when appropriate, fast track processes will be set and used to fit market requirements, while ensuring stability.

Where requirements are identified during the course of executing this mandate that are critical to its success but, which cannot be adequately addressed by standards, they will be highlighted by either the European Standardisation Organisations or the Smart Grids Reference Group of the Smart Grid Task Force for consideration by regulators or by national implementation teams.

3 Execution of the Mandate

The planned deliverables of the mandate will be approached in 2 main parallel task stream:

- 3.1 and 3.2 (as stated below) to set up the foundations for managing the continuous engineering of standards
- 3.3 to develop standards, based on an agreed work plan.

It is requested that deliverables indicate where they cover requirements which are necessary to comply with Directive 2004/22/EC (notably Annex I points 7.6, 8.1-8.5 and 10.5). Also deliverables should take into account applicable legal requirements concerning the confidentiality of personal data protected under Directive 95/46/EC[3] and Directive 2002/58/EC[4].

Given the many parties involved (the associations represented in the SG Task Force and the stakeholders listed in the EG3 report), special attention should be paid to transparency during the process of developing these standards.

Though addressing European specificities, CEN, CENELEC and ETSI shall also take the utmost account of any relevant developments in international standardisation. Acceptance by CEN, CENELEC and ETSI of this mandate starts the standstill period referred to in Article 7 of the Directive 98/34/EEC of 22 June 1998[5].

3.1 Technical reference architecture

Technical reference architecture will be provided 9 months upon acceptance of the mandate.

3.2 Sustainable processes

A first set of Use Case management will be operational 9 months upon acceptance of the mandate. Hosting and processes will be in place.

Further tasks to be performed according to the first steps are:

- To collect and harmonize use cases
- To map use cases with standards as a source for the definition of future standards

[3] OJ L 281/31 of 23.11.1995.
[4] OJ L 201/37 of 31.7 2002.
[5] OJ L 204/37 of 21.7.1998

- To present a mapping between identified standardization needs and technical bodies (existing or new) to deliver the identified standards
- To initiate and manage the processes needed to deliver against these identified gaps
- To set-up transverse processes to manage Smart Grid top-down requirement.

3.3 First set of standards by 2012

Considering the very wide scope of requests to be answered, CEN, CENELEC, ETSI will first produce a development prioritisation of all required standards within 2 months upon acceptance of the mandate. The proposed list of priorities (importance for Smart Grid deployment, effort evaluation to answer the request) will be then validated by the Smart Grids Reference Group of the Smart Grid Task Force.

Further a comprehensive work plan will be proposed to the Smart Grids Reference Group of the Smart Grid Task Force 6 months upon acceptance of the mandate, for validation. The presentation of such a work plan will take place in a pre-study report that outlines selected priorities and that describes concrete new work items in CEN, CENELEC, ETSI, in term of in-depth expected content description, planning and workload.

In the interest of expediency, and where possible and appropriate the updating of existing standards should be given consideration ahead of creating new standards.

At the end of 2012, the reference architecture and a first set of standards (including newly delivered technical specifications) will be available.

3.4 Further iterations

If needed, all of the 3 items above will be subject to further iterations, e.g. yearly period. At the end of the period, a revised reference architecture and updated processes and a new set of standards (including newly developed ones) will be available.

4 Organizations to be involved

CEN, CENELEC and ETSI will ensure, together with the Smart Grids Reference Group of the Smart Grid Task Force, that all relevant European actors are associated with the work.

In particular, CEN, CENELEC and ETSI will invite the representative organisations of consumers' interests (ANEC), environmental protection (ECOS), workers (ETUI-REHS) and small and medium-size enterprises (NORMAPME) in addition to the associations of TSOs, DSOs and Computer and Telecommunications to take part in the standardisation work.

CEN, CENELEC and ETSI are also requested to consult with the European Commission Directorate General Joint Research Centre in order to explore if the Commission's research institutes dispose of specific competence to support the standardisation work.

CEN, CENELEC and ETSI shall also invite WELMEC (authorities of member states) and selected project leaders, in so far as it is relevant for the development of standards requested by this mandate, to take part in the work.

ANNEX A. Additional technical insights

The mandate should address technical domains, which includes:

- System and domain level application modelling
- Data modelling and description language, including model harmonisation
- Cyber security and system integrity
- Data protection and integrity, information security and privacy
- Communication Network and Information system management
- Communication standards.

It should also take into account the technical power domains impacted by the electrical network management and the connection to the Grid of new actors at any levels of voltage, such as distributed energy resources, electricity storage facilities, electrical vehicle charging stations.

Specifically regarding information security and data privacy, standards defining and maintaining the agreed set of harmonized system level requirements will be developed as proposed by EG2:

1. A detailed study of all relevant standards that are/will/or could be of use for creating secure and robust Smart Grids in today's energy markets and also those of the future.
2. Suitable standards and principles for the secure collection of metrological data from smart meters, using up to date security mechanisms, authentication, encryption, digital signature, and interference prevention.
3. A standard for the assessment of data risks within the Smart Grid taking into consideration data privacy and security at various interface points and the system as a whole.
4. A standardised set of Smart Grid services that should be agnostic to the delivery mechanism, protocol, and technical solution, but provide the same outputs to the end customer. Examples of these services are: User Authentication, Digital Signatures, Encryption, etc.
5. A high level mechanism for trust provisioning in the Smart Grid, that is contemporary with modern security techniques and appropriate for all devices in the Smart Grid included those that are resource constrained.
6. A standard for the handling of Smart Grid data, which shall be intrinsically linked to the standards on security levels and robustness assessment.
7. Suitable standards and principles to support all relevant legal requirements, especially the fundamental right of individuals' that they should be able to control the use of their personal data and information. Smart Grid systems should feature these standards and principles in their overall project governance framework and proactively embed all privacy requirements into their designs, in order to prevent privacy-invasive events from occurring. End-to-end, throughout the entire life cycle of any personal information collected, privacy is core functionality in the design and architecture of Smart Grid system components and practices.