

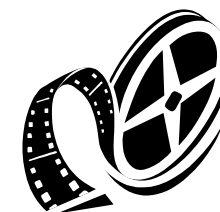
Smart Grid Stakeholders' Requirements



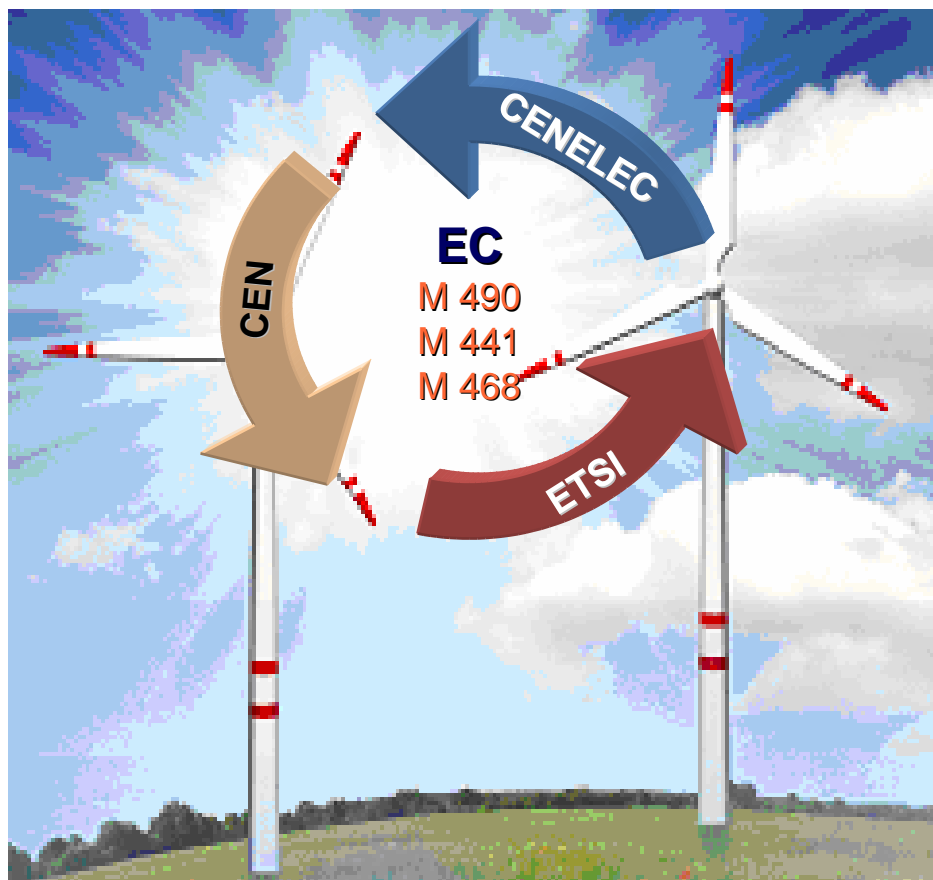
Romanian Standards Association
National Standardisation Body

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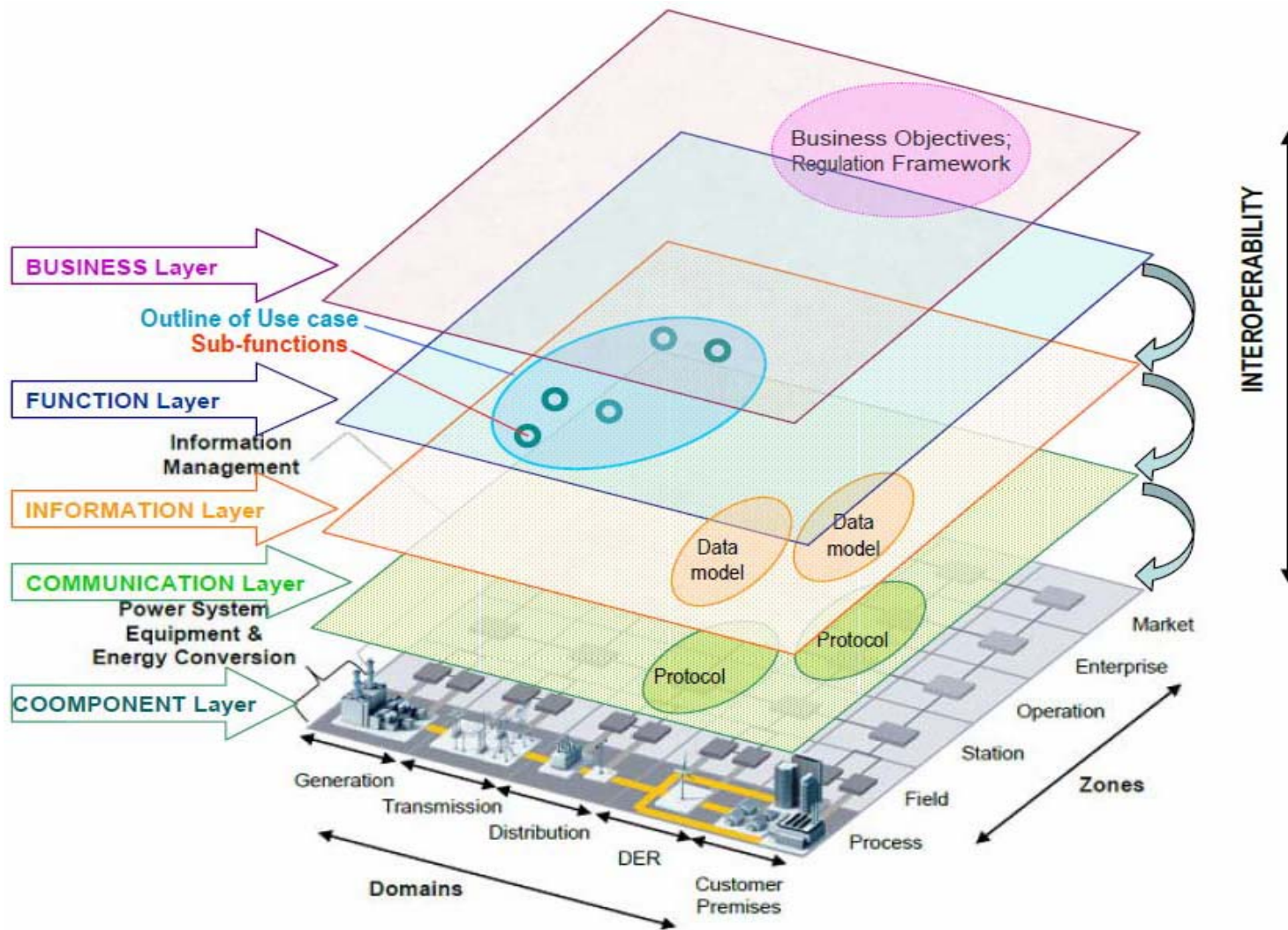


Smart Grid - Introduction



Smart Grid
 deployment implies a multitude of actions for designing, building and modernising of power systems by considering all stakeholders' requirements according to their specific rules imposed by the interactions between internal and external actors.

Smart Grid – Architecture Model



Smart Grid stakeholders

- **Bulk generation operators;**
- **Grid operators** (Distribution System Operators and Transmission System Operators);
- **Distributed generation operators (DER operators** for: the photovoltaic systems, wind turbines/farms, cogeneration plants, micro-hydroelectric power stations);
- **Manufactures of “smart” equipment** (advanced components; sensing and measuring devices, control devices; improved interfaces and decision support; integrated communication; smart appliances);
- **Service providers** (e.g. the aggregators, energy suppliers, meter operators, telecommunication providers, data management, system integrators, and others);
- **Regulation authorities and standardisation organisations;**
- **Customers** (end users) and others.

High-level requirements

for smart grids related to standards



The following requirements can provide an evaluation framework for smart grid solutions given in the existing documents:

- **Interoperability** – the devices provided by different manufacturers shall be able to communicate with each other and have a common semantic understanding in order to achieve a seamless communication between all layers of the Smart Grid.
- **Performance** – the smart grid requires high-performance hardware and software;
- **Security** – the network should be secured with strong cryptography and security across all layers/domains and at every endpoint;
- **Multi-purpose architecture** (modularity);
- **Manageability** – utilities should be able to apply standard IT skill sets in managing the network and applications;

High-level requirements for smart grid related to standards

- **Scalability** – the hardware and software needs to scale and support millions of endpoints;
- **Self-configuring, self-healing** – in case of a problem: the flexibility of the automation system is required to enable the development of hardware and software configurations.
- **Affordability** – Smart Grid shall allow a reduction of overall costs for operating of electricity grids;
- **Consumer empowerment** – smart grids should enable customers to control their usage (the consumption of energy);
- **Demonstrated solutions** – the technology should be in use, across a variety of utilities worldwide, serving multiple applications;
- **Longevity** – the technology needs to have lasting and powerful communications, ample computing and remotely upgradeable components.
- **Coherence** - network models (for the energy transfer and information transfer) should be similar.

High-level requirements for standards of stakeholder groups

The high-level requirements of each stakeholder groups are given below:

a) Requirements from the perspective of grid operators (DSO and TSO):

- suitable solutions to sustain power flows and to avoid the power losses;
- enable the system security with a high level of reliability;
- support the robustness to face disturbances and prevent any large disturbance or to facilitate restoration of the system after a collapse.



High-level requirements for standards of stakeholder groups

b) Requirements from the perspective of distributed generation operators:

- clear and stable rules for DER operation;
- transparent and non-discriminatory criteria for grid access.

c) Requirements from producers' perspective:

- standards should provide the best interoperability solutions;
- well-defined security requirements in conformity with state of the art;
- clear testing and certification procedures;
- stability of standards and regulatory requirements;
- "smart" equipment manufacturers are interested in early standardisation, because they need suitable standards for the design of new products.



High-level requirements for standards of stakeholder groups

d) Requirements from the perspective of service providers:

- standards should comprise principles for assessment methods of data risks within the smart grids;
- clearly defined processes for energy market communication (e.g. data models);
- non-discriminatory data access and suitable standards concerning user's security.

e) Requirements from the perspective of regulation authorities and governments:

- co-relation of standards with regulatory aims.
- suitable standards to apply economies of scale, promote competition and innovation, and speed up the smart grid deployments.



High-level requirements for standards of stakeholder groups

f) Requirements from customer' perspective:

- customers are willing to reduce the electricity cost to meet environmental targets and to enjoy the power quality;
- consumers' preferences and privacy shall be respected;
- flexible communication applications;
- assurance of data protection;
- safety and security.



Specific requirements

The specific requirements relate to the high level capabilities and the system's functions, make up the biggest proportion of the **SYSTEM REQUIREMENTS**.

The **performances' optimization** and **permanent assurance of physical security and cyber security** are essential conditions for **Smart Grid stability**. Therefore, the relevant requirements should be analyzed taking into account the **rules imposed by the Energy** experts in close collaboration with **ICT** experts.

We will take into account only the following features:

- **Interconnection rules** (concerning **DER integration** and **grid control**);
- **Specific applications** for the control/monitor of electricity consumption by grid operators and customers (**smart metering** and **demand response**).

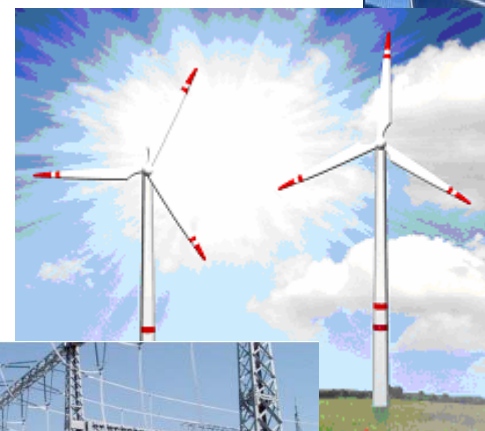
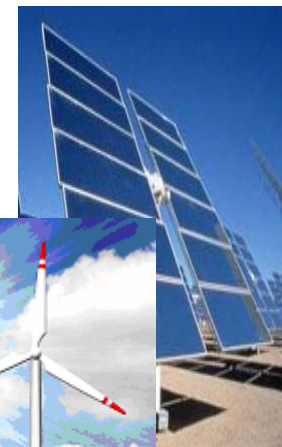
Interconnection rules - DER integration and grid control

DER integration

requires the access to the electricity networks by different interconnection actions.

The **interconnection rules** shall cover the specific requirements related to:

- **management of power systems** (especially, for the grid management and security);
- **power quality assurance** for consumers (voltage dips/swell and frequency, interruption index, EMC compatibility, etc.).



Interconnection rules - DER integration and grid control

From **Energy experts' perspective**, the interconnection rules are referring to the following aspects:

- **power flows** (currents) or different types of electricity exchanged between the entities involved in the interconnection process;
- **correspondence of the nominal/rated values** (voltage, frequency etc.) of the entities involved in the various types of interconnections;
- **reliability** and **security** - collaborating entities should arrange to share and coordinate forecast system information, along with real time information, in order to enhance the analysis and modelling of security applications (software) on the energy management systems;
- **security** of the personnel;

Interconnection rules - DER integration and grid control

- **Grid control:**
 - **Substation Automation**
(SCADA systems: configuration and reconfiguration, etc.) and
 - **Distribution Automation**
(Voltage/VAR regulation, etc.) have a crucial importance for the system power stability.

- **Advanced Metering Infrastructure** development - it plays an important role for the effective integration of renewable energy sources in the public distribution grids.



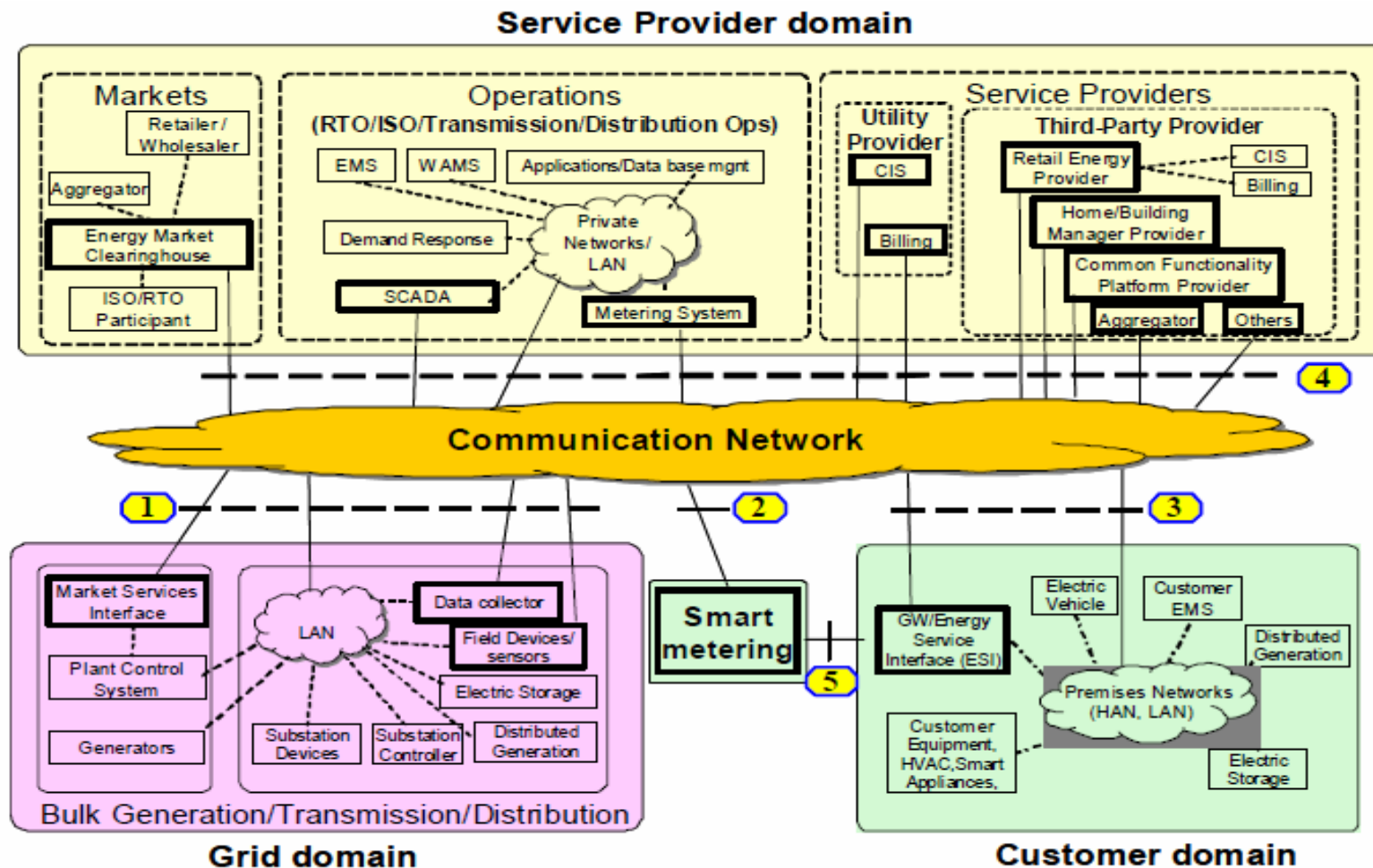
Smart Grid – Specific requirements for applications

From **ICT experts' perspective**, the requirements for all **specific applications** (smart metering, demand response and those for grid control etc.) are referring to:

- **Network security** - confidentiality, integrity, availability, privacy, etc.;
- **User, control and management plane** - control function for guarantee of communication quality, communication protocols, scalability etc.;
- **Physical equipment** - shall support the specific control/monitor/storage functions for Energy domains and Market/Service providers.

Smart Grid – Communication

interactions between domains/layers



Prioritisation of specific requirements

The specific requirements may be grouped into three large categories according to their relevance:

- **1st** category: of central importance for the respective stakeholder group ("**required**" rules);
- **2nd** category: of high importance - this kind of requirements may be considered as "**recommendations**";
- **3rd** category: "**optional**" requirements.

Evaluation criteria for Smart Grid documents

- **High-level evaluation criteria:**
 - The standards should represent the consensus of all stakeholders from national, regional and international level;
 - The standards shall be well-defined and measurable - standards should include reliable, verifiable and measurable information;
 - The standard's scope should be adequate to cover the user's needs and easy to understand;
 - All term definitions to be included at the beginning of each standard, and they should be used consistently;
 - Standards shall be easy to read in order to facilitate their implementation.
- **Specific evaluation criteria** are intended for collection and analysis of technical requirements.

Conclusion

The expected results in the whole process, including the collection and analysis of the stakeholders' requirements and related documents, will be used as basis to prepare new **Smart Grid standards**.





*Thank you
for your attention!*

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