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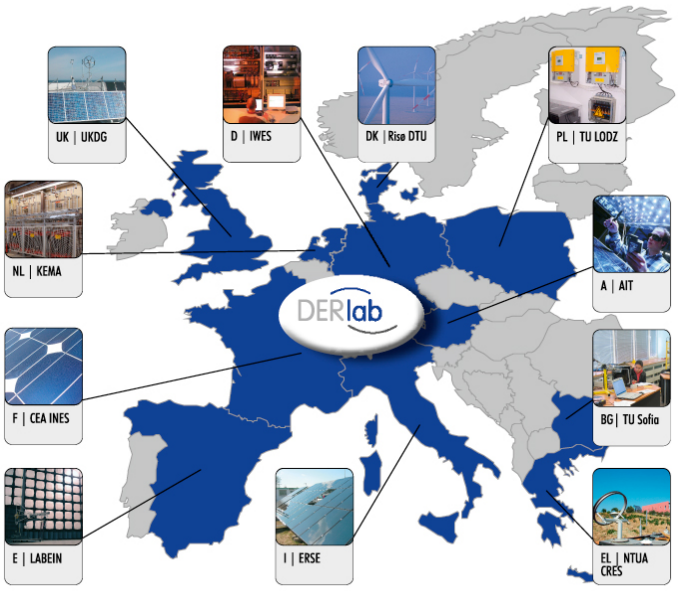
Comments on ERGEG Position Paper on Smart Grids (E09-EQS-30-04)



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Preface

The DERlab network welcomes the ERGEG initiative on smart grids. DERlab and its members have been and are currently involved in various research projects and standarddisation initiatives at national, European and international level trying to develop, test and harmonise the different approaches. The mission of DERlab is to perform tests as well as pre-competitive and pre-normative research supporting the transition of contemporary electricity supply networks towards more decentralised generation. The ERGEG position paper (E09-EQS-30-04) was distributed among the DERlab members and the answers collected and compiled. Thus the answers and comments below represent a common view of leading European testing laboratories and research institutions in the area of distributed energy resources.

1. Introduction

Question 1	Do you consider that networks, transmission and distribution, are facing new challenges that will require significant innovation in the near future?

Transmission and distribution networks are facing new challenges.

Concerning the infrastructure these are for the transmission level related to the connection of new large-scale renewable generation sites and to the enhancement of the trans-European grid. For the distribution level related to the increasing number of distributed generation units and the rising automation/ communication requirements especially in the low voltage networks.

Concerning the network operation the role of the services located at the different network levels has to be re-defined. As the generation on distribution level is increasing the different distribution networks have to play a more active role in the operation of the whole system.

Question 2	Do you agree with the ERGEG's understanding of smart grid? If not, please specify why not.

We do agree in general.

Also the scope of smart grids is much larger than smart metering, it is useful to analyse the role of smart metering in order to give a contribution to the smart grid deployment.
Smart meter is the natural interface for information exchange between end-user and the grid facilitating an active role of the user (or prosumer) in a more efficient overall management of the grid.
Small metering is also important in order to collect measures able to give an accurate and reliable imagine of user's energy consumption; assuming an appropriate and representative set of users, that allows forecasting the future requests of the whole network.

Question 3	Do you agree that objectives of reducing energy consumption impose the need for decoupling regulated companies' profit from the volume of energy supplied? How can this be implemented?

Yes, to foster the energy efficiency of the network and the support energy savings of the consumer by the network operator profits have to be decoupled from the volume of energy supplied. In general the focus should be more on the quality of the network and network services. Under a price or revenue cap approach, a new quality factor could be included taking

into account the reduction in energy consumption (and possibly on-site generation) in the network operator's area compared to a reference network.

2. Drivers for Smart Grid

Question 4	Do you agree with the drivers that have been identified in the consultation document? If not, please offer your comments on the drivers including additional ones.

We do agree with the identified drivers. We want to stress the important part that electric vehicles can play in future distribution networks. Notably, some technologies such as micro combined heat and power (CHP) or solar-home-systems combined with surplus feed-in constitute a combination of distributed generation and active end-user participation.

It is important to note the obstacles, too. From a technical point of view these are the lacks of harmonisation of grid-codes and interconnection requirements and the gaps in the testing and certification procedures of new devices and services. Smart grids "roll-out" cannot be tested in the field and therefore new "tools" for simulation but also new procedures for testing are needed for all the innovative new elements and systems that are introduced. Standardisation activities are not drivers themselves but the activities of the stakeholders driving the process have to be backed by standardisation. Thus the regulation authorities should foster standardisation processes.

3. Smart Grid Opportunities and Regulatory Challenges

Question 5	Do you agree that a user-centric approach should be adopted when considering the deployment of smart grids?

Smart grid is a complete transformation of the electrical infrastructure where the user for the first time takes an active and determinant role, thus the shift to the user's perspective is necessary, but the rest of the actors involved are equally important. Neglecting this could possibly create a non-applicable idea of power networks. This has even been already stated in point 3.2.: "Moreover, since the grid operators will also be beneficiaries of smart grids, their commitment and active participation is both crucial and already now well incentivised through a number of foreseeable benefits".

It is important to note that it might become difficult to engage a large percentage of the small scale (residential) customers because energy is (often) not an issue yet and for relatively poor people (where the energy bill is an issue) they might not be able to pay for the "solution" to reduce demand. The regulatory challenge in this context will be how to activate the potential of residential customers for the operation of a smart grid and who should be in charge for this activation.

Question 6	How should energy suppliers and energy service companies act in the process of deploying smart grids solution?

Both are stakeholders (receive benefits and have an interest that it not fails) for smart grids and therefore they should participate actively and willing to invest and should take a proactive role by offering new services, opening up the possibility for a second revenue stream. But since one of their main objectives must be economic profit, sometimes short-term profit, regulatory measures to maximize medium/long-term global benefit will have to be adopted by the regulator.

Question 7	Do you think that the current and future needs of network users have been properly identified in Section 3.3?

Future network challenges have been identified properly. However, more stress should be put on ancillary services which can be provided by customers/users employing distributed energy resources connected to the grid by converters. Potential for distribution network ancillary service markets is increasing in parallel with the increase in electricity generation from distribution networks. Anticipating future ancillary services in the specification of requirements for grid inverters is very important. It can be concluded that grid converter ancillary services are essential for:

- energy producers - effective energy generation, increasing the reliability of electric power supply,
- network operators - increasing the functionality and efficiency of electric energy conversion and distribution, increasing the reliability of electric power supply, improvement of voltage quality,
- end-users - increasing the reliability of electric power supply, power supply conditioning (sinusoidal, balanced voltage, without voltage events), reduction of electromagnetic disturbances emission from the users' equipment (from the perspective of the electric power supplier the user can be perceived as a linear, balanced load of resistive character), increased effectiveness of energy conversion.

Power electronic energy converters interfacing distribution networks applied to accomplish ancillary services could be in the nearest future the alternative solutions to power electronics systems currently used in supply networks in order to eliminate different electromagnetic disturbances.

We would like to stress the “Appropriate remuneration for ancillary services”, in which any business model should maximize all the stakeholders benefit to allow the scenario to become a reality, and the active profitable participation of small producers should have to be considered.

Concerning the particularly small customers (3.3.2) more flexible prices are necessary (albeit no unreasonable price increases) to incentivise demand participation. This should include flexible system usage fees.

Question 8	Do you think that the main future network challenges and possible solutions have been identified in Section 3.4 and 3.5 respectively? If not, please provide details of additional challenges/solutions.

Challenges related to the need of generators and “prosumers” (3.4.1):
Development of a modular universal architecture for the interconnection of distributed energy resources (DER) with the grid is the cornerstone in the process of micro-grid/ smart grid deployment. Standard functions should be defined for such systems including: power conversion, power conditioning and quality, protection, controls, metering, communications and ancillary services.

Component integration is the single most important step in streamlining interconnection. Research is needed to help increase component integration capabilities with the focus on developing a functional system architecture. This approach is indifferent to equipment specifications and seeks the development of a set of plug-and-play functional components that readily work with one another, regardless of who makes the component. Equipment performance improvements and the design of more reliable, smaller, and more durable packaging for combining the interconnection components can hasten interconnection simplification.

Additional challenges:
1) Prior to liberalisation and unbundling, vertically integrated companies could exploit the complementarities between the network and the generation segment (e.g., reinforcements or placing of new capacity). New regulation needs to provide ownership unbundled/ independent system operators (ISOs) the possibility to provide local signals for the optimal siting of new generation capacity from a network point of view.
2) In particular, distribution system operators need to be incentivised to migrate from a passive operation philosophy to active network management using innovative approaches.
3) 'NIMBY' (Not In My Back Yard) problem. It has become very hard to obtain permissions to build new overhead lines in a number of European countries, and this constitutes a significant challenge for large-scale wind power integration.

Question 9	Do you expect smarter grid solutions to be essential and/or lower cost than conventional solutions in the next few years? Do you have any evidence that they already are? If so, please provide details.

Smarter grid solutions will be essential and we expect smarter grid solutions leading to lower costs than conventional solutions in the long run, but for the next few years no lower cost are foreseen because of lack of standardisation, no practical operational experience and no large (production) volumes.

The support from the regulation side is fundamental. For example the strong wind deployment has been possible because the necessary initial support, also and mainly from regulation, considering incentives, has helped deployment until the technology has achieved a competitive price. This has to happen, in a deeper way, for instance, with grid connected electric vehicles, in order to take advantage of all the expectable opportunities considering the grid operation and potential business models.

This question will be investigated as part of the EDISON project (at Bornholm, www.edison-net.dk).

Question 10	Would you add to or change the regulatory challenges set out in Section 3.6?

We agree basically with the indicated main lines and general challenges. When any news specific challenges arise, the adequate regulatory actions have to be assessed and implemented in an - as much as possible - worldwide scenario. Of course, regulatory challenges should also deal with many (conventional) issues such as security of supply. It is convenient to stress the necessity to take care of, for instance, the user's participation and benefit.

We would like to stress that care must be taken to distribute costs as well as benefits of the deployment of a smart grids in a fair way among the different involved parties, like independent power producers (central and distributed), network operators on transmission and distribution level, energy suppliers (vendors), metering service providers and "prosumers".

Encouraging innovation (3.6.1):
Under incentive regulation (price/ revenue cap, yardstick), there is a substantial incentive for network operators to cut costs. This in turn may induce them to focus on short-term cost reductions rather than to engage in innovation activities since the latter may require more risky investments and maybe of rather long-term effect. This applies in particular to distribution system operators (DSOs). Therefore, the inclusion of innovation-specific regulatory instruments in network regulation seems essential. Only few Member States have such explicit regimes incorporated. Good examples are Denmark with a PSO element in the network tariff part of which may be used to finance demonstration projects and the IFI (Innovation Funding Incentive) in the UK allowing DSOs to spend up to 0.5% of their revenue on R&D.

4. Priorities for Regulation

Question 11	Do you agree that regulators should focus on outputs (i.e. the benefits of smart grids) rather than inputs (i.e. the technical details)?

Basically we agree. However, the benefits of smart grids should be combined with general technical objectives e.g. interoperability as general objective could lead to less proprietary solutions. But the way to interoperability must be defined by the stakeholders.

Question 12	Which effects and benefits of smartness could be added to the list (1) - (7) presented in Section 4.1, Table 1? Which effects in this list are more significant to achieving EU targets? How can medium and long-term benefits (e.g. generation diversification and sustainability) be taken into account and measured in a future regulation?

Most significant for the EU targets are no's 2 and 3 followed by 1, 4 and 5. 6 and 7 are important to enable "one European Market" with scale benefits and integration of (future) large renewable energy sources (RES) like offshore wind, hydro and big solar thermal power.

The performance indicator of benefit (1) “Increased sustainability” should not only focus on carbon emissions, but could be enhanced by avoiding long-term problems with waste (for instance nuclear or carbon capture and storage), or diversity of bio-energy crops. The performance indicator could for example summarise “external costs” of the power generation. “Increased sustainability” should also consider “quantified reduction of fuel imports” at European level.
In benefit (4), voltage quality is definitely a measure of the power quality, but there are other perturbations which cannot be neglected: harmonics, etc or even frequency stability if we also consider isolated power systems.
In benefit (5), the ratio between minimum and maximum demand could be reduced also by a higher minimum demand, this contradicts energy efficiency efforts for base load equipments (e.g. circulating pumps, refrigerators). Instead the peak power evolution within a defined time period could be considered.

Additional issues to be considered:
1) Mitigation of market power could be reached by smaller, distributed power markets and an increase in demand elasticity (induced by flexible demand): the number of market agents increases both on the demand and the supply side.
2) Export potential of new technologies (e.g., ICT) for smart operation to third countries may enhance industrial competitiveness in Europe.
3) More customer engagement and appreciation of power delivery (nowadays view: ugly, health risk, not in my backyard, etc., but everybody expects a cheap and reliable supply).

Question 13	Which output measures should be in place to incentivise the performance of network companies? Which performance indicators can easily be assessed and cleansed of grid external effects? Which are suitable for European-level benchmarking and which others could suffer significant differences due to peculiar features of national/regional networks?

It is clear that for the EU to reach its political objectives of ensuring sustainable and secure electricity supplies, it will be essential to provide an appropriate policy framework supporting system operation in the near future. If distributed energy systems only displace the energy produced by central generation but not the associated flexibility and capacity, the overall cost of operating the entire system will rise.

In this context a discussion is needed about incentives and regulations concerning ancillary services. The provision of ancillary services can, for example, be made compulsory by law

(e.g. fault ride through requirements), and the services can be paid for on the basis of available capacity or by use. The services could be also market-based and paid for at market prices (e.g. balancing services). Different approaches (payments by the transmission or distribution system operator to the providers for recovering the costs when the services are mandatory, negotiated or auctioned contracts, open market with bidding, etc.) can be explored in the search for an optimum solution, taking into account that, in general, it would be very difficult, if not impossible, to develop business cases for investing in DG solely on the basis of ancillary service income.

Output measures for performance of network companies:
- Reliability measures (frequency and duration of supply interruptions),
- Power and energy quality (also in view of future ancillary service procurement methods),
- Level of regional transitory balance between generation and consumption of energy.

Question 14	Do you think that network companies need to be incentivised to pursue innovative solutions? How and what output measures could be set to ensure that the network companies pursue innovative solutions/technologies?

A small percentage of the energy prices or the revenues of the network operators but also of power producers and metering service providers should be collected in a national or European research fund. This fund could be used for financing research and deployment of innovative solutions.

A R&D program could be created and monitored by a representative group of stakeholders (network companies but also governmental bodies etc) to guarantee that also long-term R&D is done.

Deployment of innovative solutions will in turn optimise the business operation and reduce costs, which could be an incentive in a price-cap/ yardstick regulation mode.

Question 15	Do you consider that existing standards or lack of standards represent a barrier to the deployment of smart grids?

Yes, this makes mass production for manufactures very difficult and is a drawback for the development of new energy related services. But part of the problem is also the very different ways (distribution) grids are designed throughout Europe. Therefore standardisation of grid designs is urgently needed.

Question 16	Do you think that other barriers to deployment than those mentioned in this paper can be already identified?

The main barrier is the lack of standardisation not only in the technologies but also in the concept of smart grid. Most important is to provide a clear and general definition of what smart grid really means and which technologies are going to be involved.

Further barriers:
1) Market requirements constitute another barrier: e.g., minimum capacity requirements for trading on wholesale markets as well as high annual trading fees may impose barriers for small producers.
2) Ineffective implementation of unbundling provisions (ownership/ ISO for TSOs, legal and functional for DSOs) may aggravate creation of level playing field.

Increased activities in education and training of stakeholders and public information in the area of new smart grid technology will lower the barriers.

Question 17	Do you believe new smart grid technologies could create cross subsidies between DSO and TSO network activities and other non-network activities?

This can easily happen. The technical tasks (demand-side-management, quality of supply, grid operation, etc) and resulting benefits of a smart grid are complex and closely interwoven. Thus the unbundling and the technical and administrative interfaces between the stakeholders must be carefully defined.

Question 18	What do you consider to be the regulatory priorities for electricity networks in relation to meeting the 2020 targets?

1) Standards
2) Innovation and R&D e.g. to develop new network tools and test facilities for smart grids solutions.
3) Changing network regulation to incentivise network operators to accommodate renewable production into their network operation activities.
4) The reimbursement and neutralisation of TSOs and DSOs both for higher complexity in network operation as well as potentially lower volumes transmitted.

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