

## EEGI and EDSO: the initiative to develop European Smart Grids

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### ABSTRACT

The European Electricity Grid Initiative (EEGI) is one of the European Industrial Initiatives (EIIs) under the Strategic Energy Technology Plan (SET-Plan). The EEGI Roadmap and Implementation Plan formulates a 9-year European research, development and demonstration (RD&D) programme to accelerate innovation and the development of the electricity networks of the future in Europe. The programme focuses on system innovation rather than on technology innovation, and addresses the challenge of integrating new technologies under real life working conditions and validating the results.

The 9-year programme cost is evaluated at 2B€ and the total cost of the projects to be started over the period 2010-2012 is evaluated at 1B€.

The network operators have had a central role in the development of the Initiative and will play a key role in its implementation through their associations EDSO-SG and ENTSO-E ("European Distribution System Operators for Smart Grids" association and "European Network of Transmission System Operators for Electricity" association, respectively).

### INTRODUCTION: THE EUROPEAN CONTEXT

The need to reduce greenhouse gas emissions and mitigate climate change has led to new European energy policies and a need for a radical transformation process in the energy structure of industrialized countries. This transformation is fostering growing competition and diffusion of renewable energy sources that will be further developed and integrated in a more efficient electrical system through the use of new technologies.

New generation electricity networks will play a strategic role in the achievement of 20-20-20 European objectives as defined in the EU Climate Energy package.

To achieve the 20-20-20 objectives a new planning and coordination plan has been created, the Strategic Energy Technology Plan, adopted by the European Commission in late 2007 and consolidated by the Communication of the European Commission "Investing in the development of Low Carbon Technologies" in November 2009. The SET Plan aims to:

- accelerate innovation of low carbon technologies;
- deal with both energy dependence and environmental sustainability issues;
- facilitate the link between research and the market, thus pushing EU companies in a leadership position in low carbon technologies;

- deal with the dispersion of financial resources and fragmentation of EU research strategies.

The SET Plan proposes the creation of eight so-called European Industrial Initiatives (EII). These initiatives identify some of the technology priorities where European cooperation can bring added value.

One of the mentioned initiatives is the European Electricity Grid Initiative (EEGI), a 9 year 2B€ research development and demonstration programme (RD & D) initiated by electricity transmission and distribution network operators to accelerate innovation and the development of the electricity networks of the future in Europe, a Smart Grid, that can revolutionize the design criteria of existing networks and enable innovative scenarios for a more flexible, efficient, and secure electricity system.

### THE EEGI INITIATIVE AND THE PARTICIPANTS

Following the launch of the SET Plan, a group of 7 European DSOs (Distribution System Operators) and 7 European TSOs (Transmission System Operators) presented to the European Commission a program of RD&D projects to be developed in different geographical, climatic and social conditions and tested on different electricity systems in operation: the European Electricity Grids Initiative (EEGI). The program was officially launched on June 3<sup>rd</sup> 2010, during the SET Plan Conference in Madrid.

The EEGI will require an ad-hoc management, and contains some characteristics that distinguish it from other initiatives in the SET Plan:

- The main challenge today is to integrate and develop innovative technologies in the electricity system and validate their performance under real operating conditions on the ground. The program is therefore focused on innovating the electricity system rather than on technology innovation, under the responsibility of network electricity system operators;
- The solutions to be validated within the EEGI are enablers of other initiatives. It is therefore needed that the EEGI initiative interact with other EIIs, in particular the Solar European Industrial initiative (SEII) and the European Wind Initiative (EWI);
- Grid operation is governed by rates set by regulators, but in many European countries the existing tariff schemes do not include sufficient incentives to finance the necessary RD & D projects identified in the program. An appropriate regulatory framework with incentives for innovation will be needed in the future.

## GOVERNANCE PRINCIPLES

The governance structure of the SET Plan addresses several levels of responsibilities in line with the financing sources:

- The SET Plan Steering Committee composed by European Commission and Member States, sets the overall strategy and the guidelines for implementation;
- The EEGI "EII team" monitors the program design, implementation and revision. It will be composed of representatives from public authorities (MS, EC), network operators and other electricity system representative stakeholders. A Stakeholder Board has also been proposed, which would be periodically consulted by the EII Team, involving stakeholders that are not part of the Team.
- The implementation and operational level, under the responsibility of network operators, includes the implementation and monitoring activities of individual projects

## THE EEGI SMART GRIDS MODEL

In Europe, one of the most popular definitions of the Smart Grids today has been proposed by the European Smart Grid Technology Platform. It defines the intelligent network as "a power grid that can intelligently integrate the actions of all users, and its related-generators, consumers and prosumers (neologism to describe those who are at once producers and consumers) in order to deliver efficient, safe and sustainable supply electricity."

The EEGI has been focused on the main features of intelligent networks needed to achieve the vision and objectives of the program.

A smart grid model has been developed which drives the process of defining features and projects necessary to ensure that the most critical aspects are addressed and duplications are avoided.

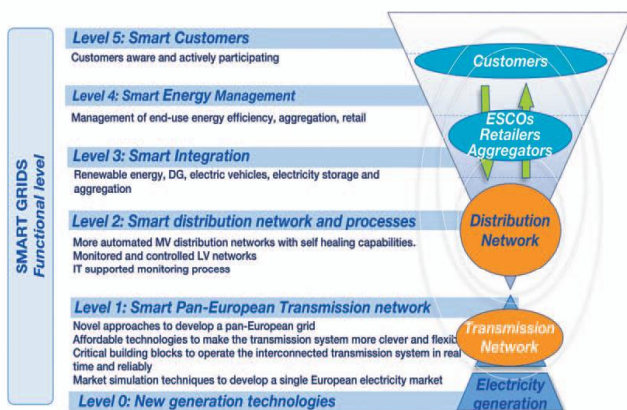


Figure 1: EEGI Smart Grids model

The smart grid model (figure 1) consists of 5 functional levels:

- **Level 0** covers centralized electricity generation technologies, the majority being connected to the

European Transmission Grid and located anywhere in Europe or beyond, including present and future wind or solar farms.

- **Level 1** covers transmission issues, the responsibility of which corresponds to European Transmission Operators.
- **Level 2** covers the issues that are the exclusive responsibilities of DSOs.
- **Level 3 to 5** cover issues that require the involvement of DSOs, grid users connected to the distribution network (as generators and customers) and free market players (as retailers and aggregators).

## ACTIVITIES ON THE DISTRIBUTION NETWORK

RD & D activities to be performed on distribution networks in the period 2010-2018 were defined on the basis of the intelligent network model shown in Figure 1, for each of the four levels related to the distribution networks.

The RD&D activities needed for the distribution network over the period 2010-2018, have been organized in four clusters according to the corresponding levels in the Smart Grids Model and twelve in functional projects in order to both ensure the full coverage of the most critical issues and avoid duplication of efforts.(Figure 2)

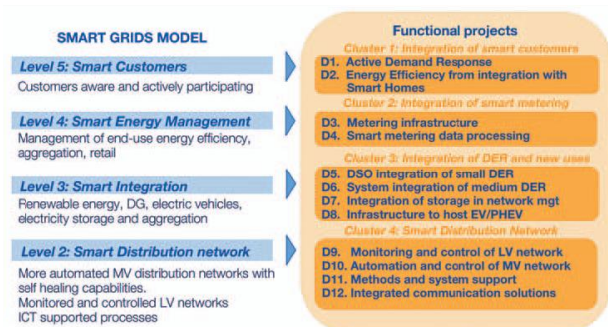


Figure 2: Activities on the distribution network

Taking into account the differences between EU27 countries - not only in climate and customer typology, but also in the state, architecture, operating conditions, and regulatory aspects of their network- additional local demonstration projects are needed for each functional project. In this way it will be possible to compare alternative solutions and acquire all the knowledge necessary to meet the needs expressed by the functional projects.

## COST AND BENEFITS ASSESSMENT

The estimated cost of the 9 year RD&D programme is 2 B€, a large amount that can only be provided through the support of regulatory bodies and Member States, alongside the European Commission and industry partners.

A detailed implementation plan has also been created which covers priority projects that should start urgently,

in the period 2010-2012. The investment in the priority projects is estimated at 1 B€ to cover their full duration. In order not to delay priority projects, a significant support from public sources (EC and Member States) is needed in a transition phase to incentivize the participation of network operators until new tariff incentives are implemented.

The purpose of the EEGI program is to facilitate an effective and efficient dissemination of smart networks in Europe. The major benefits will be obtained when the identified solutions are implemented on a European scale, which is expected to take place gradually over the period 2010-30.

In summary, the main expected benefits are:

- Greater ability to connect distributed generation from renewable sources to the network;
- Integration of national networks in a real pan-European market-based network;
- High quality level of electricity supply granted to all customers;
- Active participation of users in the market and in energy efficiency programs;
- Development of new services to fulfill new customer needs, such as the gradual electrification of transport;
- Opening new business opportunities for actors thanks to the development of a smart network (active demand).

In order to monitor projects' progress, control project costs, ensure the subsequent rollout of results, and assess benefits, Key Performance Indicators (KPIs) for each project and for the whole program have been identified.

### THE ROLE OF EDSO-SG

The Association of European Distribution System Operators for Smart Grids (EDSO-SG), founded by leading European DSOs in March 2010 and open to broad participation of European distributors, is the first international association of distribution network operators. The association was born to represent the DSOs in the EEGI and is a key partner along with ENTSO-E to develop and facilitate the spread of the Smart Grid.

EDSO-SG also provides its contribution to the Task Force on Smart Grids, established by the European Commission in November 2009, to facilitate the implementation of the smart grids, and to share the experiences already gained in Europe in the development of intelligent networks. The aim is to identify technological challenges that need to be addressed in the next ten years and thereby achieve an evaluation of costs and benefits, associated risks, and necessary economic and regulatory incentives.

To date, 19 European Distribution System Operators have joined the EDSO for Smart Grids Association

throughout the Union representing about 50% of the electricity metering points.

### CONCLUSIONS

The development of the future European intelligent electricity network will have to fulfill four fundamental requirements :

- Guarantee connection to all renewable energy resources;
- Guarantee a reliable electricity energy supply;
- Be efficient to guarantee lower costs and lower greenhouse gas emissions;
- Be flexible to adapt to new consumer behaviors, like the active participation of consumers in electricity generation and massive deployment of electrical vehicles.

The creation of the European Electricity Grid Initiative and the founding of EDSO-SG represent an important step forward in accomplishing the important challenges ahead to develop a truly "European Smart Grid" and comply with the ambitious 20-20-20 European Energy targets.

### REFERENCES

- 1- EEGI Roadmap 2010-18 and Detailed Implementation Plan 2010-12, May 25<sup>th</sup> 2010
- 2- EDSO for Smart Grids Press Release, September 10<sup>th</sup> 2010