

## Electricity Infrastructures towards Smart Grids.

### *T&D Europe position paper on two European Commission proposals on guidelines for trans-European energy infrastructures (COM(2011) 658 final) and establishing the Connecting Europe Facility (COM(2011) 665)*

1<sup>st</sup> February 2012

#### Introduction

Time has come to massively deploy technology and create the “smart” electricity grid which Europe needs to fulfil both its 20/20/20 targets and its energy policy strategy towards 2050.

As provider of that technology, the companies gathered within T&D Europe<sup>1</sup> have closely followed and participated in the discussions with the European Union institutions, the Member States and all stakeholders.

Much has changed since 2007 when the EU Commission set out its R&D agenda via the Smart Grids Forum (formerly the Smart Grids Advisory Council). These changes include:

- widespread acceptance of Smart Grids as a major contributor for:
  - avoidance of black-outs
  - integration of massive proportions of renewables
- electric vehicles/ e-mobility, which have emerged as major issues, not only related to electricity costs,
- the change in nuclear power policies in the aftermath of Fukushima
- the SET plan and its daughter initiatives (e-storage, wind, solar, etc...)
- the launch of large-scale Smart Metering programmes

To reach the 20/20/20 targets, investments in Transmission and Distribution infrastructure needs to be taken as a high priority. EU energy policy objectives need to be supported by a reliable pan European electricity grid infrastructure capable of interconnecting and integrating large-scale, variable renewable energies. In particular, the power transmission system needs to be upgraded and will have to be structurally rather different from that of today.

The comments below offer T&D Europe’s contribution at the time when:

- The European Commission Communication on “Smart Grids: from innovation to deployment” is under discussion within the European Parliament and the Council

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<sup>1</sup> T&D Europe ([www.tdeurope.eu](http://www.tdeurope.eu)) is the European Association of the Electricity Transmission & Distribution Equipment and Services Industry, whose members are the European National Associations representing the interests of the electricity transmission and distribution equipments manufacturing and derived solutions. The companies represented by T&D Europe account for an annual production worth over € 25 billion EUR, and employ over 200,000 people in Europe.

- The European Commission Smart Grid Task Force has completed its work
- The Smart Grid Forum has undertaken a review of its Strategic Research Agenda to define a vision towards 2035
- the GRID+ project launched in October 2011 has started managing the EEGI (European Electricity Grid Initiative)
- The preparation of new European standards is moving at high speed (Mandate M490)
- The European Commission has presented on 19<sup>th</sup> October 2011 two proposals on energy infrastructure priorities and on a Connecting Europe Facility.

## 1. Electricity Infrastructures towards Smart Grids.

In our view, the present situation of the European electrical infrastructure network can be described as follows:

- Conventional bulk power plants are located closer to the consumers than the renewable bulk power plants (off-shore wind farms or solar farms) will be
- Networks to serve the consumers are ageing and weak in the perspective of increased stress due to wide and dispersed connection of renewables (several black outs took place during recent years)
- The potential to significantly reduce losses on current electricity networks is limited due to the limitation of AC lines with maximum 420kV
- The resilience of the current network to unexpected disasters (natural disasters or terrorism) is limited, especially in peak periods (Cold winters, hot summers) due to the lack of redundancy and interconnections.

In this context the proposal for a set of guidelines and a financial mechanism, which will replace and significantly strengthen the current TEN-E framework is very much welcome, even if it is limited. Indeed, as pointed out by the Commission itself, only for the high voltage electricity transmission system, some €140 billion investments will be necessary by 2020. The regulation proposals only aim at financing €9.1 billion for all energy infrastructures over the same period.

T&D Europe is convinced that the implementation of all necessary measures must be accelerated in order to achieve the EU 20/20/20 goals on time. One major concern is due to the very formal and complex permissions and approvals procedures, necessary to build a new line, a power station, or any other large infrastructure, leading to huge delays. It is very complicated and significantly delays the construction. Those formal legal procedures should be shortened and harmonised across the EU. This is why the proposals on public grants and public participation are particularly welcome, even if they only apply to “projects of common interest” as defined in the regulation proposals.

As a whole, the companies represented within T&D EUROPE can provide the technology for many of the possible changes in the European electrical infrastructure network:

- Implement DC links to reinforce the current AC Grid and increase power load of existing lines
- Develop DC switchgear to enable a future construction of a full DC network
- Increase voltage level of transmission lines (high voltage energy distribution points have to be close to the consumers) to increase power load of existing lines and decrease losses
- Installation of additional power lines (e.g. for connection and transmission of renewables, avoid black-outs)
- Reduce the length of the lowest voltage network and therefore reduce the network losses
- Reduce losses and increase power load by deployment of reactive power compensation
- Develop a safety/reliability concept (cyber security, reliability, fire load, confidentiality etc.) which would allow consumers to get confidence in the smart-grid
- Implement a common power management system in Europe
- Enable power access for up-coming e-cars

## Power Transmission Systems

When considering the experience already achieved in some technologies, it is recommended to take initiatives on a short and medium term, such as:

- Complement the current 420 kV grid with an additional overlay grid, possibly as HVDC.
- Set possible use of 800 kV AC voltage which also needs to be considered.
- Create meshed grids/networks which will require the use of DC circuit breakers with high power breaking capacity.
- Study a hybrid transmission system consisting of HVAC 420 kV+ and HVDC overlay network with state-of-the-art patterns of operation
- Study the interoperability of equipment and systems, particularly converter stations, from different suppliers, which will be a key factor from the operational point of view.

Management and monitoring of wide areas of the grid with relative control systems across state boundaries will be required. It will also be required to address the potentially problematic operations of managing such hybrid transmission systems, when they are open to power contributions from many volatile sources. The reliability of supply in the different phases of the operations, with volatile sources, will have to be tested and supported by proper regulation (regulation in the sense of Grid-codes by network Regulators, not in the sense of EU legislation).

It is recommended that pilot projects (lighthouse projects) be identified for deployment in a larger framework at EU level. It is also recommended that the technologies deployed in such projects be quantified using methods and KPI (Key Performance Indicators) that identify the benefits with respect to the EU 20/20/20 targets.

## Power Distribution Systems

Power Distribution is more obviously, though by no means exclusively, impacted by the changes implicit in the basket of evolutions often referred to as the smart grid. The distribution system operators (DSOs) need to gain more experience and they need to be supported for R&D spending in this field by appropriate regulation.<sup>2</sup> The current approach, using only cost-analysis to assess risk, penalises the highly technological changes required, for instance to integrate small-to-medium sized renewable sources. System operations in distribution will have to evolve to a new standard in reliability as well as functionality to guarantee proper reliability of supply.

The RD&D of pilot projects in this sector, in the short-medium term, using the recommendations from the EEGI will speed up the knowledge sharing process among the different DSOs. For mid-long terms objectives, what is actually indicated in the Strategic Research Agenda could be applied.

## Transmission and Distribution

Additional points, for both transmission and distribution, coming out of the discussions in connection with the SRA 2035 in the Smart Grids Forum, should be considered:

- Reactive power control in Distribution:
  - technology for FACTS (Flexible AC Transmission Systems), etc. exists, but is not yet affordable in Distribution
  - there is need for commercial, economic solutions for distribution
- Demonstration projects developed for trial in the existing network are still relevant and are a major bottleneck
- Design of less-proprietary solutions
  - utilities need to collaborate in the design of functionalities, i.e. specifying functionalities rather than technologies
- Considering the evolving assets:
  - the network will continually be changing and have an increasing number of intelligent nodes
- Need to move towards an overall philosophy for both transmission and distribution operations
  - separation of transmission and distribution will not be so necessary for technical reasons
  - there is a need to develop a grid code for low voltage and medium voltages
  - the architecture of a transmission grid with a lot of DG and RES, etc. will also affect the distribution grid. We need to find a way for transmission and distribution systems to work technically together.

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<sup>2</sup> Regulation in the sense of Grid-codes by network Regulators, not in the sense of EU legislation

## Conclusion

T&D Europe will continue to actively participate in all forums where public and private stakeholders discuss and shape both the electricity infrastructures and the smart grids deployment policy.

Generally there could be advantages for the grid industry to interact with other sectors/industries:

- design power plants and plant for other electrical-energy-intensive industries (chemical, refining, etc.) in coordination, as an alternative approach to storage of energy
- car manufacturers to enable better operability
- interfacing the smart metering data with the smart grid system

While welcoming the important steps forward proposed by the European Commission in COM(2011) 658 final and (COM(2011) 665, we will, in particular, further push for the European Union to enact a piece of legislation guiding their proper deployment. In our view this should take the form of a directive, developing a harmonized approach to all issues (technical, privacy/data protection, organisational, cross issues between energy and ICT, interoperability), with clear identified targets in energy efficiency, CO<sub>2</sub> reduction, integration of renewables and KPIs in identifying customer services related to the objectives mentioned above.