The European Association of the Electricity Transmission and Distribution Equipment and Services Industry

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Position Paper for Energy Policy T&D Europe WG1 - V3

Electricity is the backbone of every modern society and economy and is the most intelligent and flexible carrier of energy. Electricity can be simply transmitted, safely consumed with no emissions, and, owing to the technological developments, it can be generated in a multitude of ways – with a significant reduction of CO_2 released into the atmosphere. The energy mix for power generation is increasingly based on renewable energies such as water, wind and sun, and CO_2-free nuclear power. Classical thermal power generation is necessary in response to demand, but can be developed in future by new technologies such as CCS[1]. Electricity can be used in a versatile manner and, for the future, it offers the best opportunities for a sustainable and energy-efficient power supply.

We assume that power consumption will rise and important actions to improve energy efficiency in power generation, transmission and distribution are required, as well as in the use of power by final end users. In future, electricity will be used in further applications and will partly replace consumption of fossil fuels (transport and heat pumps for instance).

Together with sustainable and climate-friendly power generation, the security of supply is an important criterion in the decision-making process: the last major blackouts in Europe are not very far behind us.

Today's political discussions are first and foremost concentrated on power generation and the question of the optimum and most sustainable energy mix. The political consequences and the demands for an increased proportion of renewable and decentralised power generation as well as power generation away from the point of consumption (wind, sun and conventional fossil power stations) require massive adaptations in the grid, both for transmission and for local regional distribution.

The further growing importance of electricity and fundamentally new demands therefore require extensive innovations and investments in the

[1] Carbon Capture and Storage

T&D Europe aisbl ▪ Diamant building ▪ Boulevard A Reyers 80 ▪ B 1030 Brussels ▪ Belgium
Tel : +32 2 706 82 61 ▪ fax : +32 2 706 82 53 ▪ e-mail : secretariat@tdeurope.eu ▪ www.tdeurope.eu

power grids. An extension of the electricity networks is necessary for various reasons:

- Power generation at new locations – with both onshore and offshore wind and solar energy and conventional power stations.
- Increased demand for electricity in fast growing member states of the EU, with adaptation to different regional developments within the member states.
- Further expansion of decentralised and renewable power generation – adaptations especially in the distribution network for the lower voltage levels.
- Ensuring supplies in the light of the increasing obsolescence of the networks.
- Additional measures to secure network stability and regulate the flow of energy.
- Exchange of energy and electricity trading require increased trans-national networking in Europe.

As a result of the new demands placed on the grid, new processes, control methods and market models are necessary to facilitate new forms of generation and load management in the grid by stronger networking and communication. The vision of an intelligent network of the future is being developed and described in the European technology platform Smart Grids[2]. The aim is the integration of a multitude of decentralised generation points with fluctuating energy production.

The European manufacturers of power engineering and T&D equipment are globally recognized. The change of generations in the electricity industry and grids in Europe can therefore draw on an efficient European manufacturing base, and in reverse, technological change offers the opportunity for companies to be internationally successful, based on the favourable and innovative references they have acquired in their domestic markets. The necessary transformation of the grids in Europe can therefore contribute to European competitiveness if the challenges are faced at an early stage – at best immediately – and development and research are thus initiated in Europe.

[2] European Technology Platform ETP "Smart Grids" http://www.smartgrids.eu/

Necessary actions for future development of the electricity grids in Europe:

Deregulation and market roles

The deregulation of power supply is fundamentally supported by T&D Europe, and should be further pursued, observing the technical background conditions. As a result of the monopoly character of the electricity grids, liberalisation has been associated with an unbundling of previously integrated functions and a new regulation of the networks, leading to different, new and independent market roles. The requirement for a new intelligent network (Smart Grid) however necessitates a stronger overview of the systems. For example, load management on the basis of dynamic tariffs, orientated for instance towards the power supply from uncontrollable wind energy, once again requires coordination between the independent market roles of network operation and power trading and sales. There is a need here for an optimum coordination of fluctuating power generation and consumption overall and in response to market conditions, across all the stages of the value creation process.

Political objectives and regulation

At present, frequently contradictory political concepts can be discerned. On the one hand, energy efficiency, climate protection and sustainability are up for discussion and being promoted in research programmes, and on the other hand regulation of the networks subjects investment decisions to an excessively one-sided cost orientation. In addition to cost-effectiveness, regulation must be aimed at further political objectives such as climate protection and security of supply.

After all, the conditions for the achievement of the political objectives (20-20-20 by 2020) are mandatory.

The broad implementation of the Smart Grids concepts currently developed and demanded as well as measures to promote energy efficiency are essentials to fulfil the EU objectives.

Energy efficiency

In order to achieve the demanding political objectives, the electricity grids must also be examined for additional opportunities in terms of energy efficiency. Benchmarking of the networks and a prescription of energy efficiency in the grids are conceivable political steps, as currently transmission losses in the grid are passed on to all consumers

and therefore there is no sufficient incentive to deal efficiently with energy. Instead, energy efficiency measures should be rewarded and promoted appropriately and taken into account in the regulation system. A clear demand to consider a life cycle approach, security of supply and energy efficiency for this kind of long term investments is needed, as it seems that due to financial reasons (short break even) the advantages of equipment with higher investment costs and better energy efficiency (e.g. transformers) are not considered sufficiently.

Emissions trading

Technical opportunities to increase energy efficiency are set out in the ELECTRA report: HVDC lines[3], a stronger focus on power factor compensation as well as FACTS[4], a rise in voltage levels, the use of more energy-efficient products (such as new, low loss transformers), a reduction of balancing and reserve power resulting from intelligent network control (virtual power stations and load management), and an expansion of the grids, etc.

Investment and planning security

The long life of products, ranging up to 70 years, and thus extremely long tying up of capital invested in the electricity grids require stable parameters, which are increasingly difficult to achieve. These are opposed by climatic change, serious price fluctuations for primary energy sources and changing political conditions (e.g. discussions on unbundling, regulation projects and the promotion of renewable energy). Investments in networks are becoming more and more difficult and less calculable for privatised network operators. The consequences are postponed or abandoned investments, which would however have been urgently required, because the required break even time is too short for the long term investments. Stable political conditions, limitation of long-term risks and a favourable background for investments are the necessary conditions for secure power supply in the future. Regulators might require and publish information needed to

[3] HVDC = High Voltage Direct Current Transmission

[4] FACTS = Flexible AC transmission system, defined by the IEEE as "a power electronic based system and other static equipment that provide control of one or more AC transmission system parameters to enhance controllability and increase power transfer capability." (Link)

valuate the status of the network, e.g.: ageing structure age of transmission and distribution equipment.

Security of supply

The blackouts of recent years have illustrated the vulnerability of our society in relation to our accustomed standard of living (domestic infrastructure, transport etc.). Electricity grids in particular as widespread "critical infrastructure" have to be designed to withstand disruption by natural disasters (adaptation to climate change and the expected extreme weather situations) or terrorist attacks. The potential technical solutions include a stronger intermeshing of grids, internationally and with redundancy, cables instead of overhead lines, improved monitoring and automation (rapid fault locating, fast reaction by remote switching, etc.), decentralised power generation with an opportunity for stand-alone operation, innovative power electronic systems like FACTS and HVDC, and so on.

Faster implementation of infrastructural measures and new lines

The planning and implementation of the network expansion which is urgently required is at present highly time-consuming at best, and almost impossible. Acceleration of planning is required if the electricity grid is not to become a bottleneck impeding the development of renewable energy.

Further development and firming up of the Smart Grid concept

Following the research projects pursued to date, practical lighthouse projects now have to be defined and a roadmap developed for the broad deployment of innovative technologies. This also includes the preparation for a corresponding legal, political and economic background (see, for instance, the notes on deregulation above).

Lighthouse projects (examples)

- HVDC lines for the transmission of electricity power generated remotely from the load (e.g. offshore wind, fossil fuelled power stations close to ports, solar power from the Sahara, hydroelectric power from Scandinavia) – HVDC as the basis of the vision of a "supergrid" in Europe to handle various renewable
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- generation technologies and thus minimise today's need for back-up power stations (balancing and reserve power).
- Intelligent networks – virtual power stations, load management, dynamic tariffs, smart metering.
- Wide area monitoring and control.
- Decentralised power generation with solar power stations (photovoltaics, thin film technology, self-sufficient buildings, etc.).

Research requirements (examples)

- Energy storage technologies
- Electric- / Plug-in hybrid vehicles
- Superconductivity
- Further smart grids research and development especially on distribution level as defined in the European Technology Platform "Smart grid" or the US initiative "IntelliGrid"
- Further developments on innovative materials useful for T&D

Education and training

Development of and research into new technologies and the planning and implementation of projects are impossible without well trained specialists and engineers. The attractiveness of university studies in a technical subject should be emphasised at the school stage. Dealing with technology and technical challenges has to be integrated in a general education, by reference to technical matters in classical disciplines or by separate technical subjects.

Concluding remarks

Energy is necessary nowadays in all walks of life. In the light of our limited resources, the importance of energy policy and energy efficiency is growing. T&D Europe regards it as a duty to make a contribution to efficient power supply and thus to ensure a high standard of living in the future.

For any further information, please contact Nadi Assaf, Secretary General of T&D EUROPE