

Vision on Sustainable Power and Energy Systems

An IEEE European Public Policy Initiative Position Statement

3 September 2017

The IEEE¹ European Public Policy Initiative (EPPI) endorses the European Commission's conclusions that the development of sustainable power and energy systems in Europe is critical to ensuring the competitiveness and long-term development of the European economy. In particular, EPPI endorses:

- The 2020 climate and energy package², which establishes the EU's commitment to a low-carbon economy; the promotion of "green" growth and jobs; and a series of targets to reach by 2020 in the areas of climate change and the development of renewable energy.
- The 2030 framework for climate and energy policies³, which proposes a set of targets that includes reducing greenhouse gas emissions by 40%, increasing the share of renewable energy to at least 27%, and increasing energy efficiency by 30%.
- The roadmap for moving to a low-carbon economy in 2050⁴, which sets a series of goals to move towards a low-carbon society by mid-century.

Vision for the Future

Our vision for the future is that electricity will be primarily supplied from renewable resources, with conventional power generation playing an increasingly secondary role. Given the current EU mandates and trends towards reducing carbon emissions, it is likely that conventional power generation will be derived primarily from gas and potentially nuclear power in some countries, as these are considerably less carbon-intensive methods of power generation.

¹ www.ieee.org

² http://ec.europa.eu/clima/policies/package/index_en.htm

³ http://ec.europa.eu/clima/policies/2030/index_en.htm

⁴ http://ec.europa.eu/clima/policies/roadmap/index_en.htm

Recommendations

To achieve this vision:

- Carbon free power generation must be promoted, particularly in those countries where renewable energy sources such as solar, water and/or wind resources abound.
- Limitations arising from local network constraints, such as those found at the distribution level, or constraints found at the system level, must be identified and studied, case by case, along with suitable mitigation options. Mitigation options include developing solutions for better utilisation of the existing infrastructure by digitalisation of the grid operation and building new interconnections and transmission assets, such as offshore grids.
- Options for energy storage must be studied in more detail. Storage comprises a number of technologies, to be used for many issues ranging from short-term stability to seasonal energy arbitrage, encompassing very different time scales from seconds to months, and to be potentially deployed by both regulated and market agents. Work has to be done in the area of R&D on specific technologies (batteries, thermal storage) and their integration in the power system or with multi-energy systems, as well as their regulation.
- Integrated energy management and planning must be established. Electrification of heating and transport will be critical to reducing fossil fuel dependency and improving the multi-energy system's efficiency.

European members of IEEE, who are experts on electrical power technology, are prepared to assist the European Commission in carrying out these recommendations.

The European Challenge

The turnaround for supply of all kinds of energy requires a clear European-level regulatory framework. The tighter interactions between the electricity and gas, heating and transportation sectors through electric vehicles, electric heat pumps, combined heat and power, and balancing gas resources, will require a multi-energy system view of operational, planning, regulatory and fiscal aspects, properly harmonized across the European Union. This will involve different stakeholders and decision makers from the local, country, and pan-European levels. In addition to governmental stakeholders, decision makers from the wholesale and retail energy markets, as well as the transmission and distribution networks for electricity, gas, heating and cooling, must be included in these efforts in order to foster real competition and make optimal solutions emerge. Adequate coordination of all stakeholders is therefore needed within the European-level regulatory framework. At the same time, the regulatory framework should

account for regional differences, so that member states can converge towards the same goals from different starting points.

In light of the continuous changes outlined above, existing standards for the planning and operation of power and energy systems should be re-evaluated and (if needed) updated. These updates should include new and emerging ICT capabilities, and anticipate unmet needs.

Advanced Electrical System for the Future

The following areas are identified as vital to improving the electrical system and its interactions with the energy system as a whole:

- Reliable, secure and resilient grid operation
 - ✓ Utilization of new technologies to enhance grid intelligence to support local and system-level power balance requirements;
 - ✓ Active power and frequency control through power reserve schemes that are suitable to cope with variable and relatively unpredictable renewable energy sources;
 - ✓ Local, reactive power balancing and voltage control, separated by voltage levels;
 - ✓ Stand-alone operational mode of network areas after separation from the main grid (island operation); this includes the promotion and regulation of microgrids;
 - ✓ Deployment of new transmission infrastructure to connect offshore resources and to strengthen the European grid e.g. using new HVDC (high voltage direct current) or HVAC (high voltage alternate current) technology; and
 - ✓ Well-tested capability to re-energise the system after disaggregation, e.g. following a black out (“black start”).

- Economical and efficient energy delivery
 - ✓ Development of a seamless and transparent pan-European electricity market, where the only constraints to transnational energy flows are tie-line capacities, which could in turn be optimally extended to further facilitate cross-country trading;
 - ✓ Promoting distributed generation and demand side resources participation (smart distribution grids) in system operation (including provision of reserves) through suitable technical (planning and operational standards) and commercial (aggregation) initiatives;
 - ✓ Promotion of reliable and economic energy storage;
 - ✓ Fostering a technical understanding of multi-energy systems, followed by structured commercial and regulatory integration of other energy sectors with the electricity one;
 - ✓ Development of a more efficient consumer side infrastructure (e.g. DC electricity distribution for homes and offices, and intelligent buildings);
 - ✓ A coordinated approach towards security of supply on a pan-European scale.

A consistent policy framework, appropriately tackling the different challenges and ensuring that technological developments are followed by the implementation at a commercial scale, will contribute decisively to a better security of supply and economic growth in Europe.

This statement was developed by the IEEE European Public Policy Initiative and represents the considered judgment of a broad group of European IEEE members with expertise in the subject field. IEEE has nearly 55,000 members in Europe. The positions taken in this statement do not necessarily reflect the views of IEEE or its other organizational units.

Contact Information:

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