# Vision on Sustainable Power and Energy Systems

## An IEEE European Public Policy Committee Position Statement

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The IEEE European Public Policy Committee (EPPC), representing a large community of European engineering professionals, 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, the EPPC endorses:

- The 2030 framework for climate and energy policies in the Fit-for-55 Package, which proposes a set of new targets that includes reducing greenhouse gas emissions by 55%, increasing the share of renewable energy to at least 45%, and introducing binding and more stringent energy efficiency targets.
- The roadmap for moving to a carbon-neutral economy in 2050 as enshrined in the European Green Deal, which sets a series of goals to move towards a carbon-neutral society by mid-century.

### Vision for the Future

Our vision for the future is that electricity will be primarily supplied from renewable sources, with conventional power generation playing an increasingly secondary role. Given the EU objectives to reduce carbon emissions, ensure the affordability of energy and guarantee security of supply, it is likely that in the near future conventional power generation will be based on natural gas (as a transition fuel, with appropriate diversification of supply) and nuclear power in some countries, as these are considerably less carbon-intensive methods of power generation. In the long term, hydrogen and/or synthetic, carbon-neutral fuels may complement a renewables-dominated generation mix.

### Recommendations

To achieve this vision, the EPPC recommends that:

- Carbon free power generation shall be promoted, i.a., via effective, stable carbon pricing and carefully designed financial support and de-risking instruments (e.g., contracts-for-differences), particularly in those countries where renewable energy sources such as solar, water and/or wind resources are abundant.
- During the transition towards a renewables-dominated energy system, natural gas shall continue to play a significant role. We support a careful, continuous assessment of the risk of a constrained natural gas supply and diversification of suppliers to mitigate this risk.
- Limitations arising from local network constraints, such as those found at the distribution level, or constraints found at the system level, shall be identified and studied, case by case, along with suitable mitigation options. Mitigation options include developing solutions for better utilization of the existing infrastructure by digitalization of the grid operation, building new interconnections and transmission assets, such as offshore grids, as well as exploring alternatives, such as local storage assets.

- Options for energy storage shall be studied in more detail. Storage comprises several 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, power-to-X, thermal storage) and their integration in the power system or with multi-energy systems, as well as their regulation.
- Integrated energy management and planning shall be established. Electrification of a significant share of the heating and transport sector will be critical to reducing fossil fuel dependency and improving the multi-energy system's efficiency. For some applications in these sectors, such as long-distance shipping and aviation, the carbon-neutral alternative is not yet clear.

## The European Challenge

The turnaround for supply of all kinds of energy requires a clear regulatory framework at the EU level. 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 EU. 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 EU 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 limitedly predictable 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, without overlooking alternative options where possible; and
- Well-tested capability to re-energise the system after disaggregation, e.g., following a black out.

*Economical and efficient energy delivery*

- Development of a seamless and transparent pan-European electricity market, where the only constraints for electricity flows between market zones are tie-line capacities, which could in turn be optimally extended to further facilitate inter-zonal trading. Achieving this can be done by restructuring market zones and/or reinforcing inter- and intra-zonal transmission capacities;
- 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 initiatives at all voltage levels;
- 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, etc.);
- A coordinated approach towards security of supply on a pan-European scale, as advocated by ACER.

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 decarbonizing the EU's energy supply, a better security of supply and economic growth in Europe.

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*This statement was developed by the IEEE European Public Policy Committee (EPPC) Working Group on Energy and represents the considered judgment of a broad group of European IEEE members with expertise in the subject field. IEEE has nearly 60,000 members in Europe. The positions taken in this statement do not necessarily reflect the views of IEEE or its other organizational units.*

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