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European Metrology Network on Smart Electricity Grids
on the
Call Scope Green Deal / Pre- and Co-Normative / Research Potential
related to the EU Green Deal

The European Metrology Network on Smart Electricity Grids (EMN SEG) aims to realise a coherent response to smart electricity grid measurement needs and to maximise the impact of R&D in smart grid metrology. In total 21 National Measurement Institutes (NMIs), designated institutes (DIs) and universities have joined forces in the EMN with the overarching ambition to make EURAMET the prime European player and liaison for measurement support of electricity grids, and world-wide focus in electricity grid measurement science.

Electricity grids are deeply connected to the European Energy Union strategy that puts priority on renewable energy, smart energy systems and energy efficiency in order to 'build a low-carbon, climate resilient future' via 'secure, clean and efficient energy'. Grid stability and quality of supply are affected by the significant uptake of renewable energy sources (RES) and grid energy losses need to be reduced in order to meet EU climate targets. Smart grids are the proposed solution to Europe's electricity supply infrastructures, changing patterns of supply and demand, and reliable connectivity.

Recognising the need for a coordinated approach on measurement challenges related to the future of the electrical grid, the EMN SEG has been developing its Strategic Research Agenda in close consultation with multiple stakeholders at national and European levels. These include government and public institutions, utilities, producers, Transmission and Distribution System Operators (TSOs, DSOs), industry associations, industries and equipment manufacturers, standardisation organisations and research centres.

Based on these consultations, we summarise the key priorities and areas of interest as:

- Security, stability and quality of electricity supply, in particular related to the increased connection of RES to the electricity grid and the increased electrification in e.g. industry, heating and cooling, and transport.
- Advanced electricity grid monitoring to detect anomalies and atypical behaviour, to improve real-time decision making, to optimise maintenance and total cost of ownership, and to maximise the integration of RES to the grid.
- Digital substations and related intelligent technology to modernise the grid.
- Improved long-distance electricity transmission, both AC and DC, and new hybrid AC/DC systems and meshed DC transmission and distribution grids to enable large-scale RES uptake.
- Smart and secure electrical energy metering
- Increased energy efficiency, across the complete chain from electricity generation, transmission, distribution and end use.
- Storage to increase the uptake of renewables, improve grid stability and support new business models to satisfy emerging demand concepts.

These priorities align very well with the call scopes of the Green Deal / NRM / RPT call 2021 from European Partnership on Metrology, in particular with the topics

- Supplying clean, affordable and secure energy
- Accelerating the shift to sustainable and smart mobility

Therefore, we encourage Potential Research Topics (PRTs) to address metrology needs in the following areas:

- Advanced grid sensor networks to improve the stability and quality of electricity supply, and support the increased uptake and stable integration of RES.
- Analytical tools for evaluation of the massive data streams – big data – resulting from grid monitoring instrumentation, resulting into actionable information to support electricity grid operators in decision making and grid monitoring and control.
- Maximizing RES hosting capacity and reducing reinforcement investment by using measurement to enable dynamic rating, demand side management and dynamic management of grid compatibility levels.
- Metrology in support of modern digital substations and related technologies, including instrument transformers and sensors and the required time dissemination and synchronization methods.
- Metrology in support of increased voltage and current test limits and increased reliability of grid equipment test and characterisation techniques, e.g. non-destructive testing techniques for commissioning or preventive maintenance.
- Metrology infrastructure to assist in the development and deployment of new hybrid and flexible AC/DC networks and meshed DC transmission and distribution grids.
- Electrical metering metrology in support of regulation and smart consumption needs in the context of emerging RES, new DC, E-mobility and smart grids.
- Measurement systems for loss and distortion measurements in key grid components, including converters/inverters that connect RES and e.g. electrical vehicle charging stations to the electricity grids, as well as energy converters that interconnect electricity grids to other energy-consuming sectors (heat, gas, traffic).
- Evaluation methods and standards for wasted energy and energy efficiency, across the complete chain from electricity generation, transmission, distribution and end use.
- Improved characterization of batteries, fuel cells and other storage technologies.
- Measurement concepts for figures of merit in power-to-X, storage and charging processes.

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