

Title: Support for a European Metrology Network on smart electricity grids

Abstract

Electricity grids are a key enabler of the “Energy Transition” to make our energy system sustainable, but they face huge challenges due to the desired uptake of renewable energy sources. So far, more than 13 JRPs in EMRP and EMPIR have provided metrology support for the development of (smart) electricity grids, but their impact has been hampered by a lack of higher-level coordination.

EURAMET intends to establish an EMN on Smart Electricity Grids to realise a coherent NMI response to measurement challenges in electricity grids, to provide a single point of contact for stakeholders and stakeholder organisations, and to maximise the impact of R&D activities in the field. The EMN ambition is to make EURAMET the lead player world-wide in electrical grid metrology. This SNT is intended to support that network in their initial tasks.

Keywords

Energy Transition, Renewable Energy, Electricity Grids, Smart Grids, Network, Impact, Smart Specialisation, Joint Research Agenda, Knowledge Transfer.

Background

To “build a low-carbon, climate resilient future” via “secure, clean and efficient energy”, the Energy Union strategy puts high priority on renewable energy, smart energy systems, and energy efficiency [1-3]. This strategy has a profound impact on our electricity grids – the backbone of our modern society. The major uptake of renewable energy sources (RES) results in complicated bi-directional energy flows in the grids, affecting grid stability and quality of supply. Transforming the electricity grid to a ‘smart grid’ is crucial to allow for this change and to consolidate the present high levels of security and quality of supply. The electricity grid not only has to become ‘smart’ but also should improve its efficiency. To reduce losses, grids are operating at increasingly higher voltages and grid components have to meet stringent efficiency requirements, such as those set by the European Ecodesign Directive [4-5].

More than 13 JRPs under EMRP and EMPIR so far have provided the metrology support to these developments [6-7]. Projects include metrology support for smart grids, digitisation of substations, high-voltage DC (HVDC), high-voltage (HV) testing, and railway grids. To support standardisation, four projects are presently running ranging from standardisation on smart meters to testing of high-voltage equipment. One of the strengths of the grid metrology JRPs are the substantial number of involved stakeholders. Many of the JRP activities are performed with active support of stakeholders, for example in on-site testing at sites provided by utilities and testing of equipment together with manufacturers.

However, there is a significant need for more coordination in electrical grid metrology. The ambitious energy agenda of the EU requires careful alignment of R&D efforts to ensure that metrology solutions are available when needed. The metrology community can only meet the challenges by agreeing well in advance with all relevant stakeholders what metrology is needed and when, and by carefully coordinating national programmes within the framework of a European joint research agenda. Stakeholders need long-term commitment and a coherent, well-considered approach, giving them confidence that their (long-term) metrology needs are addressed by the metrology community, instead of the present projects that are started ‘ad-hoc’ when a certain need is expressed.

There is very significant value in JRP research results from past, existing and future JRP projects. Stakeholders need easy access to these results; they do not want to visit the many individual project web sites in order to

find the research addressing their needs. Instead they need a simple, comprehensive platform that provides information and answers across the full extent of relevant projects.

Given the costs of facilities and the distribution of R&D activities across NMIs, a complete European metrology infrastructure can only be sustained by smart specialisation. NMIs will be better able to provide solutions for their national stakeholders by using the resources provided by the metrology network, instead of having to realise the full spectrum of services and facilities in-house. In addition, NMIs investing in a unique and capital-intensive facility will profit from a pan-European exploitation through the infrastructure of the network.

For stakeholder organisations on the European level, there needs to be a recognisable entity that represents the metrology community in discussions on measurement issues related to the future of the electric grid and the energy transition. Contacts are now for a large part with individual NMIs on an ad-hoc or project base, and no NMI has the mandate to speak on behalf of its peers. From the NMI side, there is a need to establish liaisons with stakeholder organisations complementing and enhancing the present individual stakeholder contacts. On a wider perspective, there is a great need for NMIs to be more visible as metrology solution providers. All too often, stakeholders are unaware of the significant added value that metrology research can provide to their business.

After awareness has been raised, the need for practical knowledge transfer is a natural consequence. Again, this need for knowledge transfer is not tied to a single JRP, but to a technical topic and a certain level. Combining knowledge transfer from across JRPs and filling in any gaps with purpose-built material will help to satisfy the full metrology training needs of the stakeholder community.

How and where NMIs should focus limited resources in this area to obtain maximum impact for society, urgently requires a strategic plan and significant coordination both at European and global levels. No single NMI has the expertise or resource to tackle all or even a significant fraction of the most critical priorities without collaboration. Without coordination, there is a strong likelihood of unnecessary duplication, with NMIs (nationally and/or regionally) potentially independently choosing to focus efforts on the same challenge with consequential neglect of others. EURAMET intends to establish a European Metrology Network to coordinate the European NMI response, to establish close links to the stakeholder community, to develop and implement a strategic agenda and establish a knowledge, technology transfer and promotion plan, to ensure an effective response is put in place. This SNT is intended to support that network in their initial tasks.

Objectives

Proposers should address the objectives stated below, which are based on the PNT submissions. Proposers may identify amendments to the objectives or choose to address a subset of them in order to maximise the overall impact, or address budgetary or scientific / technical / legal / regulatory / market constraints, but the reasons for this should be clearly stated in the protocol.

The JNP shall focus on developing a long term ongoing dialogue between the metrology community and relevant stakeholders. This dialogue should support the take-up of research outputs from the metrology community and the collection of needs from industry to inform future research related to smart energy grids.

The specific objectives are to:

1. To establish systems within the EMN to coordinate and align national R&D strategies:
 - To set up a European joint strategic research agenda together with all relevant stakeholders, describing present and future stakeholder metrology needs in smart electricity grids.
 - To define roadmaps and strategies for meeting these needs. To discuss prioritisation of national R&D strategies with the aim to prevent unnecessary duplication and to optimise use of precious resources.
 - To liaise with instrument manufacturers and other relevant stakeholders to ensure that early take-up of future metrology R&D is incorporated into the defined strategies.
2. To significantly enhance exploitation and uptake of research results from multiple EMRP and EMPIR JRPs as well as national research activities through the realisation of a virtual knowledge hub. This web-based platform should serve as a single point of contact to stakeholders, providing easy access to the full range of smart grid metrology research results, relevant NMI calibration services, and a service desk to submit metrology needs and/or request further information.
3. To develop a plan for a joint sustainable European metrology infrastructure for Smart Electricity Grids by stimulating smart specialisation of European NMI facilities and services.

- To make a comprehensive overview of existing facilities and services across Europe and identify deficiencies.
 - To promote alignment of national R&D priorities with these deficiencies and with the future needs of stakeholders (objective 1).
 - To stimulate sharing and use of existing large grid-metrology infrastructure by all participants in the network and by the wider stakeholder community.
4. To create a widely visible identity as the voice of the European electricity grid metrology community (including logo, flyers, newsletters, etc) and to set up liaisons with relevant European stakeholder organisations such as ENTSO-E, CENELEC, WELMEC, CIGRÉ, EURELECTRIC, TD Europe, ESMIG and similar organisations world-wide such as IEC, OIML, CIGRÉ, with the European JRC on Smart Electricity Systems and Interoperability, and with related European H2020 research projects.
5. To set up an extensive knowledge transfer programme consisting of:
- Training courses, webinars, best practice guides, and other material such as publications.
 - Events and R&D activities with a significant training component.
 - A web-based mediation platform to stimulate R&D exchange via student internships, guest researcher opportunities, MSc / PhD positions, etc.

The proposed activities shall be justified by clear reference to the measurement needs within strategic documents published by the relevant stakeholders. Proposers should establish the current state of the coordination in this area, and explain how their proposed project goes beyond this.

The proposed activities should not include those essential for the establishment and operation of the EMN. EMNs will be established and operated by the EURAMET members using their own national resources regardless of whether specific EMPIR proposals are funded. EMPIR funding is for specific tasks aimed at ensuring a planned EMN will progress quickly towards contributing to the objectives of the programme.

EURAMET expects the average EU Contribution for the selected JNPs in this TP to be 0.4 M€, and has defined an upper limit of 0.5 M€ for this project.

Potential Impact

Proposals must demonstrate adequate and appropriate participation/links to the “end user” community, describing how the project partners and collaborators will engage with relevant communities during the project to facilitate knowledge transfer and accelerate the sustainability of the organisation. Evidence of support from the “end user” community (e.g. letters of support) is also encouraged.

You should detail how your JNP results are going to:

- Address the SNT objectives and deliver solutions to the documented needs,
- Provide a lasting improvement to coordination in the European metrological community and communication with their stakeholders beyond the lifetime of the project,

You should detail other impacts of your proposed JNP.

You should also detail how your approach to realising the objectives will further the aim of EMPIR to develop a coherent approach at the European level in the field of metrology and include the best available contributions from across the metrology community. Specifically, the opportunities for:

- improvement of the efficiency of use of available resources to better meet metrological needs and to assure the traceability of national standards
- the metrology capacity of EURAMET Member States whose metrology programmes are at an early stage of development to be increased

Time-scale

The project should be of up to 5 years duration.

Additional information

The references were provided by PNT submitters; proposers should therefore establish the relevance of any references.

[1] EU 2020 Energy strategy.

Available online: <https://ec.europa.eu/energy/en/energy-strategy/2020-energy-strategy>

- [2] European “Energy Union and Climate Action”.
Available online: <https://ec.europa.eu/energy/en/topics/energy-strategy-and-energy-union>
- [3] H2020 Energy work programme 2018 – 2020. Available online:
http://ec.europa.eu/research/participants/data/ref/h2020/wp/2018-2020/main/h2020-wp1820-energy_en.pdf?pk_campaign=energy-nwl-2017-10
- [4] Directive 2009/125/EC of the European Parliament and of the Council of 21 October 2009.
Available: <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:285:0010:0035:en:PDF>
- [5] Ecodesign implementation for Power Transformers: Commission Regulation No 548, Official Journal European Union, L 285, p. 10 – 35 (2014).
Available: <http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32014R0548&from=EN>
- [6] EMRP grid-related JRPs. Available online: <http://www.emrponline.eu/downloads.html>
- [7] EMPIR grid-related JRPs. Available online: <https://msu.euramet.org>, and
<https://www.euramet.org/research-innovation/emrp/emrp-calls-and-projects/>