

Important information about these documents

This call is being held ahead of any agreement from the Commission that the relevant funding will be available. At present the relevant legislation is still under discussion in both Council and Parliament, and there is no certainty on the detailed arrangements for funding selected projects. The funding of any selected project, and the terms and conditions of participation in the projects, are dependent on completion of the legislative process and the subsequent contractual processes between the European Commission and EURAMET. Proposers submit to this call at their own risk.

Background

Last year, EURAMET submitted a draft proposal to the EC for a further research programme to be established under article 185 of the Treaty on the Functioning of the European Union (TFEU) to follow on from EMRP and EMPIR. This was published by the EC at https://ec.europa.eu/info/research-and-innovation/funding/funding-opportunities/funding-programmes-and-open-calls/horizon-europe/european-partnerships-horizon-europe/candidates-digital-industry-and-space_en

The initiative would be called the European Partnership on Metrology and would aim to create, by 2030, a sustainable and effective system for metrology at European level that ensures Europe has a world-class metrology system that:

- Provides metrology solutions, fundamental metrological reference data and methods, offering fit-for-purpose solutions supporting and stimulating European innovation and responding to societal challenges.
- Supports and enables effective design and implementation of regulation and standards that underpin public policies that address societal challenges.

The Commission commissioned an impact assessment into this proposal and 11 others in similar priority areas, and, based on those findings, published their own proposal for the Partnership, their response to the impact assessment and a draft of the Decision on 23rd February 2021. See:

<https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM:2021:89:FIN>

https://ec.europa.eu/commission/presscorner/detail/en/ip_21_702

<https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52021SC0035&qid=1614677899327>

That draft Decision is currently under discussion in the European Council and the European Parliament.

Under the assumption that the Council and Parliament pass the basic act which would form the legal basis for this research programme, and that the participating countries named in the Draft Decision submit the required commitment letters, EURAMET is publishing these potential Selected Research Topics and draft guidance notes. These documents are not approved by the Commission nor will they lead to a binding decision by EURAMET e.V. for any further negotiation or funding. All published guides and templates are subject to amendment by the EC and EURAMET e.V. as further information becomes known.

Title: Metrology for digital substation instrumentation

Abstract

Digital substation technology, based on IEC 61850 and IEC 61869, is increasingly replacing conventional analogue instrumentation in the electricity grid. However, the calibration infrastructure for traceable verification of the accuracy classes of the digital instrumentation is lacking. Proposals should address the introduction of traceability to digital substation instrumentation following the new requirements of recently released standards. This would ensure reliable measurement in the European power network by an increasing number of digital instruments.

Keywords

Digital substation instrumentation, Calibration, PTP timing protocol, Stand Alone Merging Unit (SAMU), Instrument transformers, Digital test sets, Uncertainty evaluation

Background to the Metrological Challenges

Future electrical power grids will require real-time control and monitoring systems to face increasingly complex and challenging conditions. Digital instrumentation is increasingly substituting conventional analogue instrumentation. The key benefits of the new technology include a high level of interoperability and integration, reduced complexity and cost due to simple interconnects inside a substation, and operational flexibility, which will improve cyber-security and reliability of service.

Digital substation technology, based on IEC 61850, is replacing conventional analogue instrumentation. However, the accuracy of the instrumentation and their capability to provide reliable data is still lacking. This problem is exacerbated by the lack of a mature calibration infrastructure for traceable verification of the accuracy classes of the digital instruments. Traceable calibration services are now available from some European NMIs with low enough uncertainty to verify or disprove some of the instrument manufacturers' claims on the accuracy of their products. Currently, no services in the metrology community exist for verifying the phase of a signal measured from the grid concerning timing delivered using a communication network.

The proposal builds on the needs of equipment manufacturers, distribution and transmission system operators, as well as IEC and CENELEC standardization committees, to ensure that the next generation instrumentation meets the accuracy requirements of grid operators. The flexibility, productivity, as well as the environmental and human safety gained through deployment of digital substation technology (reduced footprint of sensors, reduced copper use, galvanic separation of bay and switchyard), must be traded against the high costs of decommissioning already-installed, still perfectly functioning conventional measurement equipment. This proposal will help to accelerate the increased demand for next-generation instrumentation that will replace conventional measuring equipment. This, in turn, will lead to increased turnovers and profits for those manufacturers who make use of the resulting opportunities.

Objectives

Proposers should address the objectives stated below, which are based on the PRT 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 constraints, but the reasons for this should be clearly stated in the protocol.

The JRP shall focus on the traceable measurement and characterisation of sampled value (SV) enabled equipment such as merging units, digital instrument transformers and instrument transformer measuring bridges.

The specific objectives are:

1. To develop and calibrate reference systems (hardware) for calibration of sampled value (SV) enabled equipment, covering the new requirements of recently released IEC standards. To develop new hardware for traceable measurement of new data rates up to 96000 samples per second, for the related measurement bandwidth up to ca. 40 kHz.
2. To develop software for controlling the setups and handling of SV data streams and develop new data processing and uncertainty estimation approaches for new data rates up to 96000 samples per second.

3. To develop communication and timing networks, in participating laboratories, by creating ethernet networks that will transmit SV data and PTP-based timing between commercial devices. To establish traceable link between PTP timing and PPS reference pulse with target uncertainty of 100 ns.
4. To provide the data, methods, guidelines and recommendations, which are necessary for the calibration of SV enabled equipment, to IEC TC 38 “Instrument Transformers”. To integrate the plans for future research activities on the European Metrology Network for Smart Electricity Grids (EMN SEG).
5. To contribute to the standards development work of the technical committee IEC TC 38. Outputs will be in a form that can be incorporated into future standards at the earliest opportunity and will be communicated through a variety of media to the standards community and to end users (equipment manufacturers, transmission system operators, distribution system operators, and customers).

The proposed research shall be justified by clear reference to the measurement needs within strategic documents published by the relevant Regulatory body or Standards Developing Organisation or by a letter signed by the convener of the respective TC/WG. EURAMET encourages proposals that include representatives from industry, regulators and standardisation bodies actively participating in the projects. The proposal must name a “Chief Stakeholder”, not a member of the consortium, but a representative of the user community that will benefit from the proposed work. The “Chief Stakeholder” should write a letter of support explaining how their organisation will make use of the outcomes from the research, be consulted regularly by the consortium during the project to ensure that the planned outcomes are still relevant, and be prepared to report to EURAMET on the benefits they have gained from the project.

Proposers should establish the current state of the art and explain how their proposed research goes beyond this. In particular, proposers should outline the achievements of the EMRP ENG61 FutureGrid, EMPIR 17IND06 FutureGrid II and EMPIR 17IND14 WRITE and how their proposal will build on those.

EURAMET expects the average EU Contribution for the selected JRPs in this TP to be 0.8 M€ and has defined an upper limit of 1.0 M€ for this project.

EURAMET also expects the EU Contribution to the external funded partners to not exceed 30 % of the total EU Contribution across all selected projects in this TP.

Any industrial partners that will receive significant benefit from the results of the proposed project are expected to be unfunded partners.

Potential Impact

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

You should detail how your JRP results are going to:

- Address the SRT objectives and deliver solutions to the documented needs,
- Feed into the development of urgent documentary standards through appropriate standards bodies,
- Transfer knowledge to the electrical power generation, transmission and distribution sector and to instrumentation manufacturers.

You should detail other impacts of your proposed JRP as specified in the document “Guide 4: Writing Joint Research Projects (JRPs)”

You should also detail how your approach to realising the objectives will further the aim of the potential European Partnership on Metrology 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
- organisations other than NMIs and DIs to be involved in the work.

Time-scale

The project should be of up to 3 years duration.