

Title: Metrology to support the application of the EcoDesign directive to electrical appliances

Abstract

The implementation of the Ecodesign Directive (2009/125/EC) still requires improved calibration methods for measurement systems that determine the energy efficiency of devices transforming electrical energy into other forms of energy or another form of electrical energy. Particularly motors, ventilators, pumps, power supplies and other home appliances.

Conformity with the Work Programme

This Call for JRPs conforms to the EMRP Outline 2008, section on “Grand Challenges” related to Energy and Environment on pages 8/9 and 23/24/25.

Keywords

Three-phase electrical power measurements, measurements of sporadic waveforms, dynamic torque measurements, traceable low electrical power measurements, measurements of load and no-load losses, metrology for market surveillance, traceable efficiency measurements, Ecodesign, stand-by losses

Background to the Metrological Challenges

The Ecodesign Directive [1] establishes a framework for the setting of Ecodesign requirements for energy-related products with the aim of ensuring the free movement of those products within the European market. The Methodology for the Ecodesign of Energy-related Products (MEErP) allows the investigation of all stages of the life cycle of products, taking into account environmental aspects as well as technical and economic issues. The implementation of the Ecodesign directive is done through EU-regulations, which often refer to CEN/CENELEC standards. A prerequisite for a regulation defining the requirements for a product are harmonised European standards, which must include a procedure for reliable energy efficiency measurement. Without agreed and reliable measurement methods, market surveillance is prone to false results. Orders of Market Surveillance Authorities (MSAs) could then be challenged in court by manufacturers and importers with the result that the authorities will renounced to enforce the regulation. The Ecodesign directive has the potential to save annually several hundred terawatt hours of electrical energy; increased non-compliance has a significant impact on climate targets. The report on MEErP [2] states that designers of energy related products should use figures of merit that are accurate, reproducible, realistic, economic and harmonised. Finding solutions that meet these requirements, particularly for unregulated product groups, is a challenge for the National Metrology Institutes.

In the area of motors, the challenge is to develop standard methods to measure consumption and efficiency of motors from 750 W to 375 kW and later to 1 MW. Dynamic mechanical and synchronous electrical power measurements with the required accuracy are not possible at present. In the area of ventilators and pumps, there are currently no measurement standards. No dynamic torque transducers to be used for the characterisation of machines under variable load conditions are available. There is a need for a test system with a bandwidth of up to 100 kHz to measure these signals with the required fidelity. In the area of power supplies, systems generate sporadic waveforms which cannot be measured reliably and there is a clear need to develop new methods, beyond the state-of-the-art, for traceable large bandwidth low power measurements. In the area of transformers, there is a need to develop error compensated standard current transformers with an extended operation range to achieve high accuracy of the power standard. Finally in the area of home appliances, improvements to the efficiency measurement for electrical ballast or dimmer used for light sources need to be made through development of traceable on-site power standards.

Scientific and Technological 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 JRP-Protocol.

The JRP shall focus on the traceable measurement, the development and characterisation of metrological equipment and algorithms for assessing energy efficiency.

The specific objectives are

1. To propose relevant requirements and measuring procedures to characterise the efficiency of a product group
2. To develop measuring methods to determine and quantify feedback and second order effects which influence the EROEI (Energy Returned on Energy Invested)
3. To propose efficient and effective concepts to support the legal metrological infrastructure – including market surveillance – to ensure that the industry can provide certified products

Proposals should focus on motors, ventilators and pumps, power supplies and transformers as well as home appliances as the need for metrological support is found to be most pronounced for these classes of products.

These objectives will require large-scale approaches that are beyond the capabilities of single National Metrology Institutes and Designated Institutes. To enhance the impact of the R&D work, the involvement of the user community such as industry, and standardisation and regulatory bodies, as appropriate, is strongly recommended.

Proposers should establish the current state of the art, and explain how their proposed project goes beyond this.

EURAMET expects the average size of JRPs in this call to be between 3.0 to 3.5 M€, and defined an upper limit of 5 M€ for any project. The available budget for integral Research Excellence Grants is 30 months of effort.

Potential Impact

Proposals must demonstrate adequate and appropriate participation/links to the “end user” community. This may be through the inclusion of unfunded JRP-Partners or collaborators, or by including links to industrial/policy advisory committees, standards committees or other bodies. Evidence of support from the “end user” community (eg letters of support) is encouraged.

You should detail how your JRP results are going to:

- feed into the development of urgent documentary standards through appropriate standards bodies
- transfer knowledge to the energy sector.
- contribute to the provision of harmonised (standardised) measurement and test methods which can be applied by manufacturers, conformity assessment bodies and market surveillance authorities at economically acceptable costs

You should detail other impacts of your proposed JRP as detailed in the document “Guide 4: Writing a Joint Research Project”

You should also detail how your approach to realising the objectives will further the aim of the EMRP to develop a coherent approach at the European level in the field of metrology and includes 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 Member States and countries associated with the Seventh Framework Programme whose metrology programmes are at an early stage of development to be increased
- outside researchers & research organisations other than NMI and DI to be involved in the work

Time-scale

The project should be of up to 3 years duration.

Additional information

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

- [1] DIRECTIVE 2009/125/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 21 October 2009 establishing a framework for the setting of ecodesign requirements for energy relating products
- [2] Project report on Methodology for Ecodesign of Energy-related Products – MEErP 2011, see Annex VI, p. 9