
Title: Metrology for nuclear facilities discharges

Abstract

The guarantee of the accuracy and trustworthiness of measurements of radioactive discharges is important for all stakeholders and end users involved in the utilisation of radionuclides and nuclear energy. Article 45 of Council Directive 96/29/EURATOM of 13 May 1996 and EC Recommendation 2004/2/Euratom of 18 December 2003 require the use of spectrometric measurement devices for radionuclide-specific information on radionuclides discharged to the environment for reporting to the EC. However, upgrading of currently installed non-spectrometric (total/gross counting) instrumentation to spectrometric ones is problematic, particularly due to the unavailability of any standardised integrated spectrometric measurement systems and methods. Joint Research Projects (JRPs) submitted for this topic should aim at ensuring a standardised integrated fully spectrometric system for radionuclide-specific measurement of airborne and liquid discharges into the environment from nuclear facilities, and consolidating and standardising processes and instruments used for radionuclide-specific balance measurement of discharges, as required by EC Directives and Recommendations.

Conformity with the Work Programme

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

Keywords

Discharges, effluents, measurement system, nuclear facility, spectrometry.

Background to the Metrological Challenges

Article 45 of Council Directive 96/29/EURATOM of 13 May 1996 requires the competent authorities of Member States to ensure that doses to the population from practices subject to prior authorization are made as realistic as possible; nuclide-specific information on radioactive discharges into the environment is needed for the assessment of such doses.

EC Recommendation 2004/2/Euratom of 18 December 2003 on standardised (radionuclide-specific) information on radioactive airborne and liquid discharges into the environment from nuclear power reactors and reprocessing plants in normal operation defines standardised information on discharged radionuclides. A number of studies and also recommendations of both IAEA and NEA refer to discharges monitoring.

Upgrading of currently installed non-spectrometric (total/gross counting) instrumentation to spectrometric ones is problematic, particularly due to unavailability of any standardised integrated spectrometric measurement systems. The aim of the proposed objectives is to ensure

- a standardised integrated fully spectrometric system for radionuclide-specific measurement of airborne and liquid discharges into the environment from nuclear facilities,
- consolidation and standardization of processes and instruments used for radionuclide-specific balance measurement of discharges as required by EC Directives and Recommendations.

Non-spectrometric (total/gross counting) instruments are currently installed for discharges monitoring. After EC Recommendation 2004/2/Euratom of 18 December 2003 came into force, some individual spectrometric devices were introduced step by step like

- laboratory spectrometric measurement of samples,
- sampling of H-3/C-14 for laboratory measurement,
- noble gases continuous spectrometric measurement.

However, these alone do not provide a proper solution because: proper spectrometric instruments are mostly unavailable, an integrated comprehensive spectrometric solution for balancing of discharges is unavailable, methods used for laboratory analysis are not standardised in most cases, upgrading is on different level in different countries/NPPs, individual devices are often installed instead of a comprehensive system, typical mistakes are often repeated (sampling lines iodine deposition, missing proportionality and isokinetics, missing radon compensation, low-volume particulates sampling, etc.).

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 focus of this topic is to metrologically underpin the development of integrated spectrometric measurement systems for nuclear facility discharges, as requested through Euratom directives and recommendations such as 96/29/Euratom and 2004/2/Euratom.

The specific objectives are:

1. Design and development of a standardised airborne and liquid discharges balancing integrated spectrometric measurement system covering all relevant radionuclides individually and in a comprehensive way. Such a system will include detectors, samplers, and related measurement equipment.
2. Development of supplementary metrological methods fostering the implementation of the metrological infrastructure within Europe including
 - a. improvements to nuclear data and libraries,
 - b. standardised methods for the analysis of samples,
 - c. demonstration of traceability
 - d. uncertainty analysis

The proposers shall describe how, and on the basis of what stakeholder input, they prioritise the radionuclides under consideration.

Proposers shall give priority to work that meets documented stakeholder needs and include measures to facilitate the development of European standards and Directives.

Proposers should establish the current state of the art, and explain how their proposed project goes beyond this. Proposers must ensure that they are familiar with the existing EURAMET funded Joint Research Projects (link below); proposers must explain how the project is different from the previously funded work, and describe the scientific and technological steps beyond the state of the art.

ENG08 Metrology for New Generation of Nuclear Power Plants -
<http://www.euramet.org/index.php?id=a169jrps>

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.

Where a European Directive is referenced in the proposal, the relevant paragraphs of the Directive identifying the need for the project should be quoted and referenced. It is not sufficient to quote the entire Directive per se as the rationale for the metrology need. Proposals must also clearly link the identified need in the Directive with the expected outputs from the project.

In your JRP submission please detail the impact that your proposed JRP will have on the requirements of Article 45 of Council Directive 96/29/EURATOM of 13 May 1996 and EC Recommendation 2004/2/Euratom of 18 December 2003. You should also detail other impacts of your proposed JRP as detailed in the document "Guidance for writing a JRP"

You should superficially detail how your JRP results are going to:

- feed into the development of urgent standards through appropriate standards bodies
- transfer knowledge to the nuclear sector.

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. 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 NMIs and DIs to be involved in the work

Time-scale

The project should be of 3 years duration, and it may not be possible to address all of the above objectives within that period. Proposers will need to prioritise and demonstrate the feasibility of a two-step approach, detailing the objectives that could realistically be achieved with a 3-year project. Proposers must adequately address this issue.