European Partnership on Metrology
Call 2024 –Digital Transformation, Green Deal, Normative and Research Potential

Selected Research Topic number: **SRT-n02**
Version: 1.0

Title: Metrology support for the development of standardised methods for methane emission detection and quantification

Abstract

Methane is a key greenhouse gas with a high warming potential, however effective mitigation of methane emissions can yield relatively quick climate benefits due to its short atmospheric lifetime. There are emerging requirements for industry, particularly the energy sector, with potential future application in waste management and agriculture to detect, report and reduce methane emissions. This requires reliable, comparable and validated methods. Submitted proposals should address the metrology needed to support improved methane leak detection and quantification capabilities at source and facility scales. Proposals should support development of standardised methods, providing regulators and industry with the tools needed to detect, quantify, report and reduce methane emissions.

Keywords

emissions, methane, validated measurement methods, greenhouse gas, climate change, oil and gas, methane reduction, clean energy, net-zero emissions, standardisation

Background to the Metrological Challenges

To achieve commitments made by parties to the United Nations Framework Convention on Climate Change (UNFCC) there is a need to reduce emissions of greenhouse gases. Standardisation provides a key element in delivering reliable measurements and to provide capabilities to support industry self-reporting and regulatory instruments. This SRT is driven by the need for better data related to methane emissions, and specifically to the consequent need for validated standardised measurement methods able to provide this data.

Methane is the key component of natural gas and biomethane and the second largest contributor to anthropogenic greenhouse gases. Methane is present in several key industries, including the energy sector (natural gas and biomethane), waste management, mining, and intensive agriculture. Within these industries, there are multiple sources of methane emissions including fugitive emissions (leaks), venting (intentional release due to safety conditions, equipment design or operational procedures, or incomplete combustion). The EU has defined a methane strategy with reduction targets by 2030 and is issuing methane regulations for the energy/mining sectors which support the COP26 Methane Pledge. Industry has started to reduce methane emissions, however, improved capabilities to detect and quantify methane emissions are needed to reduce emissions efficiently. Gas operators started to use a source level measurement approach (also called a bottom-up approach) to go beyond generic emission factors, as required by oil and gas methane partnership OGMP 2.0. Some companies implement leak quantification in a bottom-up approach using direct measurements such as the hi-flow sampler. In December 2023 a proposal for an EU regulation on methane emission reduction in the energy sector was published. One measure included is drawing a distinction between type 1 and type 2 leak detection and repair (LDAR) surveys, based on minimum detection limits and leak repair thresholds. This is likely to require improved standardisation to implement.

Quantifying leaks requires measurement of the concentration and flow rates. For open air measurements the flow rate is generally based on the wind, but there are not standardised methods for determining the wind field for this measurement context. This includes complex wakes that occur downstream of equipment and buildings on site, along with potential interference from the measurement method itself (e.g. UAV mounted sampling equipment). EN 17628 covers some general aspects, but the development of standardised methods for the

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meteorological parameters (or tracer flow rate in the case of tracer gas dispersion) is necessary to minimise uncertainties for these measurements.

In 2020, many operators joined the reporting framework of OGMP 2.0, the highest level of which requires site level quantification measurements (a top-down approach) to compare to the bottom-up approach. The current state of these exists across a broad, non-standardised market with heterogeneous solutions. Stakeholders including gas operators have launched many initiatives for performance assessment of those technologies, such as controlled release tests or test campaigns on industrial sites. These initiatives while providing a lot of information from each test are not harmonised and methodologies and protocols of each project are different. It is consequently difficult to gather, compare and capitalise the results in a unified way. The proposed work should focus on developing a standardised performance assessment approach to resolve this issue.

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 proposal shall focus on the development of metrology capability for methane emission detection and quantification.

The specific objectives are:

1. To provide metrology tools for source level leak detection, quantification and repair: This includes to develop validated measurement protocols, performance standards and uncertainty for component level leak detection and quantification methods such as hi-flow sampling techniques and quantified optical gas imaging and to provide updated correlation curves for use in a revision of EN 15446 for leak detection and quantification in the gas industry and other new application areas.
2. To determine the metrological performance and atmospheric variability of meteorological measurements (wind speed / direction), their impact on the calculation of mass emissions of methane and the impact on the uncertainty in conversion of concentration measurements into mass emissions, including the impact of wind/ air flow measurement. This will include investigation of complex wakes where wind passes site equipment or buildings and the impact of mobile sampling systems (e.g. unmanned aerial vehicle (UAV) mounted measurement systems) where the drone could influence the local wind field being sampled.
3. To determine the implications of the uncertainties in the methane measurement methods (Objective 1) for regulation, such as support for the methane quantification standards under development in TC 264 WG38. Sources of uncertainty include the impact of wind/ air flow measurement (Objective 2), sampling / scanning path approaches, geometry configurations such as sparse to dense obstacles, and vertical distribution of emissions.
4. To contribute to the standards development work of the technical committees CEN TC 264 and CEN TC 234 to ensure that the outputs of the project are aligned with their needs, communicated quickly to those developing the standards and to those who will use them, and in a form that can be incorporated into the standards at the earliest opportunity.

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 convenor 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 and EMPIR projects ENV52 HIGHGAS, 21NRM04 BiometCAP, 19ENV05 STELLAR, and 21GRD04 isoMET and how their proposal will build on those.

Proposers should note that the programme funds the activity of researchers to develop the capability, not the required infrastructure and capital equipment, which must be provided from other sources.

EURAMET expects the average EU Contribution for the selected JRPs in this TP to be 1.0 M€ and has defined an upper limit of 1.3 M€ for this proposal.

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

Any industrial beneficiaries that will receive significant benefit from the results of the proposed project are expected to be beneficiaries without receiving funding or associated 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 proposal's 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,
- Facilitate improved industrial capability, or improved quality of life for European citizens in terms of personal health, protection of the environment and the climate, or energy security,
- Transfer knowledge to the environmental monitoring sector.

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 Metrology Partnership 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.

Timescale

The project should be of up to 3 years duration.

Additional information

The links provided in this section are only correct at the time of publication up until the end of the Call year.

These references have been provided by EURAMET.

[1] *006 CEN TC 264 Method validation and uncertainties for methane emission measurement methods*. https://www.metpart.eu/go/need06