Potential European Partnership on Metrology
Call 2021 – Green Deal and Normative

Selected Research Topic number: **SRT-v01**
Version: 1.1

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.

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Title: Metrology support for carbon capture utilisation and storage

Abstract

As part of the European Green Deal, the European Commission proposed to raise the 2030 greenhouse gas emission reduction target, including emissions and removals, to at least 55 % compared to 1990. Carbon capture, utilisation and storage (CCUS) has been identified as a priority topic to reach this target and to enable the EU to become carbon neutral by 2050. The aim of this proposal is to develop the metrology infrastructure that will allow monitoring and leak detection of CO_2 within energy/industrial processes and transportation networks, promote the use of CO_2 removal such as CCUS, and support a better understanding of the CO_2 lifecycle. Providing metrology support in these areas will help industry to properly assess their CO_2 emissions to operate within the EU Emissions Trading System (EU ETS) and allow the use of CCUS to reduce carbon emissions.

Keywords

CO_2, decarbonisation, natural gas, hydrogen, biomethane, hydrogen enriched natural gas, carbon capture, storage, utilisation, leak detection, flow metering, purity, sampling, degradation, gas, biogas, impurities, CO_2 monitoring, emissions.

Background to the Metrological Challenges

In an effort to meet stringent climate change targets as outlined by the 2030 climate and energy framework, European countries have started to reduce carbon emissions. The European Green Deal mentions several aims involving the reduction of CO_2 from industry, such as deploying innovative technologies and infrastructure (such as CCUS), supporting companies in assessing their impact on environment to make 'green claims', understanding the economic value, environmental impact and options for recycling of waste (such as CO_2) or decarbonising the steel, chemical and cement industry.

Several European countries have included CCUS in their national plans as a means of producing blue hydrogen (from natural gas) or to decarbonise power generation and are trialling CCUS through pilot studies. Metrology support is required to test performance of new capture technologies to understand degradation and purity, and to monitor capture. Additionally, support is required to ensure safe and efficient operation by understanding phase behaviour, corrosion, avoiding toxic releases and setting/maintaining operational conditions according to key physical property measurements. Depending on the source of CO_2 and type of capture technology used, the CO_2 will need to be purified to remove, for example remaining flue gas, or to ensure purity is suitable for downstream processing. CCUS operators will need confidence in the purification online gas purity analysers and sensors, that can continuously monitor key impurities for process safety. New novel methods for purification, such as using algae, are being investigated but require tight control over gas purity.

In order to operate within the EU ETS, organisations may need to accurately monitor amount of CO_2 produced and lost in their processes through flow metering and leak detection. Pursuant to EU Regulation 2018/2066, CO_2 transferred out of an installation to a capture facility or a transport network with the purpose of long-term geological storage can be deducted from the produced CO_2 when quantifying the CO_2 emissions of the installation relevant for EU ETS. However, the condition is that a measurement-based methodology is used to quantify the transferred CO_2. Methods and infrastructure for traceable metering of CO_2 mass flow are therefore needed. No independent, traceable, flow calibration facilities are available for calibrating flow meters with CO_2 across the full range of conditions which are likely to occur in capture, transport and storage. Potential techniques for monitoring and quantifying CO_2 leaks from storage sites (including sub-sea) are available (e.g. acoustic imaging, sonar bathymetry and tuneable diode lasers) but these techniques have not been validated as possible methods for quantifying leaks for sites. To ensure performance of these instruments meets industry requirements, testing must include accuracy, selectivity (against air and other leaks), spatial resolution and repeatability.

CO_2 can be re-utilised rather than emitted or stored in geological reservoirs; CO_2 is a key commodity in the food and beverage industry, and for producing valuable materials such as aggregates for cement. Some of the products do not permanently store the CO_2; measurements will support better understanding of the lifecycle and overall environmental impact on mitigation of climate change of different carbon-embedding routes.

Process industries like cement, iron and steel, aluminium, pulp and paper, and refineries, have inherent CO_2 emissions resulting from raw material conversion. CCUS can play a part in capturing these emissions as a means of decarbonising as this is a key to achieve climate neutrality.

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 metrology research necessary to support industry in carbon capture utilisation and storage (CCUS).

The specific objectives are

1. To develop the metrology infrastructure required for monitoring CO_2 produced and lost within an industrial process through the development of new traceable facilities, including primary flow standards to enable calibration of flow meters for liquid and gaseous-phase of CO_2 with uncertainties of 1.5 % – 2.5 %, as well as validation of systems capable of quantifying CO_2 leaks from pipelines, transport (e.g. shipping) or storage sites.
2. To develop primary standards, sampling, analytical methods and models required to support industry in specifying operational conditions and to perform required measurements within CO_2 capture, transport and storage. To develop methods for CO_2 purity analysis (ISO/TR 27921), data verified models to predict physical properties (e.g. phase equilibria, density and viscosity) and testing methods to produce validated data for pipeline corrosion, capture material degradation, chemical reactions, purification and CO_2 storage. In addition, to develop and qualify instrumentation for monitoring phase behaviour and composition.
3. To develop and provide metrology facilities to support industry in the development of new technologies for capture, transport, utilisation and storage of CO_2 and in performance testing of new capture techniques, purification systems and sensors in order to facilitate rapid uptake of carbon capture in Europe.
4. To develop validated analytical methods and primary standards for the use of captured CO_2 that meet the technical specifications of European manufacturers (e.g. food industry). Additionally, to develop metrological methods to measure the degradation of products, assess their lifetime and quantify actual loss of CO_2 to the atmosphere over time.
5. To facilitate the take up of the technology and measurement infrastructure developed in the project by the measurement supply chain (accredited laboratories, instrument manufacturers), standards developing organisations (ISO TC 265) and end users (CCUS industry).

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 research, the involvement of the appropriate user community such as industry, standardisation and regulatory bodies is strongly recommended, both prior to and during methodology development.

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

EURAMET expects the average EU Contribution for the selected JRPs in this TP to be 2.2 M€, and has defined an upper limit of 2.7 M€ for this project.

EURAMET also expects the EU Contribution to the external funded partners to not exceed 35 % of the total EU Contribution across all selected projects in this TP.

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 chemical industry 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 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.