EMRP Call 2013 – Energy and Environment

Selected Research Topic number: **SRT-g09**
Version: 1.0

Title: Metrology for LNG

Abstract

Liquefied Natural Gas (LNG) has been an integral part of the EU security of energy policy for many years. In addition it has recently been identified as one of the pillars of the new EU clean fuel strategy. In comparison with other commodities like natural gas or gasoline the total uncertainty of measured energy is very high for LNG and has been estimated to be 1 %. The current lack of sound traceability leads to the delayed introduction of new measurement methods in the LNG sector. A sound metrological framework is an indispensable element for the development of LNG as transport fuel.

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 page 23.

Keywords

LNG, security of supply, sustainable energy supply, transport fuel, cryogenic flow standards, composition, methane number, LNG thermo-physical properties, thermodynamic modelling of LNG flow.

Background to the Metrological Challenges

A sound metrological framework will be an indispensable element for the development of LNG as transport fuel, which is one of the pillars of the EU clean fuel strategy – at present there is a lack of commonly agreed measurement practices and no metrological framework is currently in place. For example, there is a need to develop traceable calibration standards of LNG mass and volume flow, with the development of novel and improved methods for measuring LNG composition and a validated and improved model for LNG density prediction and associated uncertainty evaluation.

Different application areas for LNG measurement systems include large scale LNG application (import and export LNG terminals) and also small and mid-scale LNG applications (LNG as fuel, truck filling stations, mid-sized bunkering facilities). The former uses the custody transfer system (CTS), based on measurement of volume, density and gross calorific value. This CTS is affected by an absence of direct traceability to an LNG flow calibration standard at this scale, the lack of an ISO standard for LNG flow metering, the lack of a calibration standard for composition and a lack of validation at a sufficient low level of uncertainty for density measurements. The relatively new small and mid-scale application lacks a harmonized and traceable CTS - this is still under development.

A crucial element for the roll-out of LNG as transport fuel is the development of a harmonised method and related measurement technology for the determination of the methane number (a parameter related to the knocking behaviour of natural gas and the LNG counterpart of the octane number for gasoline), including a correlation of the methane number with the LNG composition.

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.

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EMRP
European Metrology Research Programme
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The EMRP is jointly funded by the EMRP participating countries within EURAMET and the European Union

The JRP shall focus on the traceable measurement and characterisation of LNG quantity and quality to support custody transfer and transport fuel applications.

The specific objectives are:

1. Development and validation of novel and traceable calibration standards of LNG mass and volume flow for vehicle fuel dispensing and ship bunkering.
2. Development and validation of novel and improved methods for measuring LNG composition to address the online monitoring of the LNG quality and issues with sampling LNG.
3. Development of a method for the determination of the methane number (including a correlation of the methane number to the LNG composition) to support the use of LNG as a transport fuel.
4. An improved, validated model for LNG density prediction and associated uncertainty evaluation.

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 and EMRP JRP ENG03 (LNG) 'Metrology for Liquefied Natural Gas (LNG).

EURAMET expects the average size of JRPs in this call to be between 3.0 to 3.5 M€, and has 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.

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 NMIs and DIs to be involved in the work

Time-scale

The project should be of up to 3 years duration.