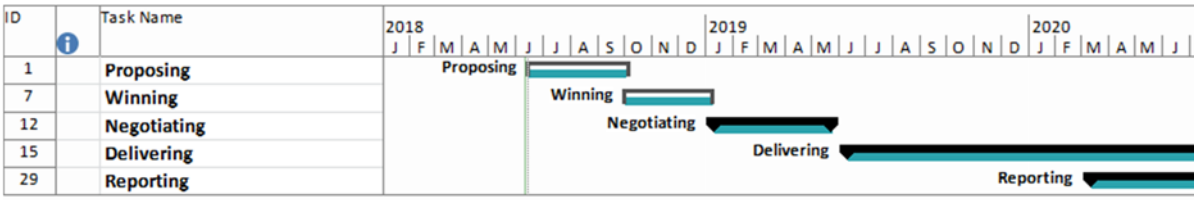
Training for Potential JRP-Coordinators

2018



This pack consists of some of the documents available at http://msu.euramet.org/downloads. They are the versions current at the launch of Stage 2 in 2018. Please check online for newer versions.

EMPIR Work Programme
EMPIR Call 2018 - Budget and Features

Document: P-PRG-GUI-056 Version: 1.1
Approved: Programme Manager 2018-06-03

The EMPIR Call Process Guides are written generically to apply to all EMPIR calls. Where there are particular numbers, dates, or options that apply to a particular call then those details are given in the table below. Readers should start with the Guides for an explanation of the call process and refer to this table when directed for the specific information on an individual TP or call.

	Joint Research Projects TP HLT	**Joint Research Projects TP SIB**	**Joint Research Projects TP NRM**	**Joint Research Projects TP RPT**	**Support for Networks Projects**	**Support for Impact Projects**
Indicative budget (EU Contribution)	20.25 M€	19.25 M€	5.0 M€	1.0 M€	1.5 M€	0.5 M€
Average EU Contribution per project	1.8 M€	1.8 M€	<0.6 M€ excluding SRT-n04	-	0.4 M€	0.1 M€
Maximum EU Contribution per project	2.1 M€	2.1 M€	0.8 M€ except SRT-n04 which is 1.5 M€	0.5 M€	0.5 M€	0.15 M€
Minimum EU Contribution per project	-	-	-	0.1 M€	-	-
Expected EU Contribution to the external funded partners (% of total EU Contribution)	35 %	20 %	30 %	10 %	0 %	0 %
Maximum number of project partners	-	-	-	-	-	5
Duration	Up to 36 months	Up to 36 months	Up to 36 months	Up to 36 months	Up to 60 months	Up to 36 months
Call Process	Two stage – PRT, SRT, JRP	Two stage – PRT, SRT, JRP	Two stage – PRT, SRT, JRP	Two stage – PRT, SRT, JRP	Two stage – PNT, SNT, JNP	Single stage – SIP
Call for PRTs / PNTs	2018-01-10 to 2018-02-19	2018-01-10 to 2018-02-19	2018-01-10 to 2018-02-19	2018-01-10 to 2018-02-19	2018-01-10 to 2018-02-19	n/a
Call for JRPs / JNPs	2018-06-14 to 2018-10-01	2018-06-14 to 2018-10-01	2018-06-14 to 2018-10-01	2018-06-14 to 2018-10-01	2018-06-14 to 2018-10-01	n/a
Call for SIPs	n/a	n/a	n/a	n/a	n/a	2018-07-24 to 2018-09-24
Proposal guide and template	4	4	4	4	11	7

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Evaluation process	The referees meet the proposers at a Review Conference before finalising their evaluation scores and producing a ranked list.	The referees meet the proposers at a Review Conference before finalising their evaluation scores and producing a ranked list.	The referees meet the proposers at a Review Conference before finalising their evaluation scores and producing a ranked list.	The referees meet the proposers at a Review Conference before finalising their evaluation scores and producing a ranked list.	The referees meet the proposers at a Review Conference before finalising their evaluation scores and producing a ranked list.	The referees meet **without** the proposers in a Consensus Group before finalising their evaluation scores and producing a ranked list.
Weighting for Excellence criteria	1.25	1.75	1.25	1.25	1.5	1
Weighting for Impact criteria	1.75	1.25	1.75	1.5	1.25	2
Weighting for Implementation criteria	1	1	1	1.25	1.25	1
Expected formal announcement of selected projects	2019-01-08	2019-01-08	2019-01-08	2019-01-08	2019-01-08	2019-01-08
Expected contract signature	2019-05-31	2019-05-31	2019-05-31	2019-05-31	2019-05-31	2019-05-23
Specific call requirements	-	-	-	-		The proposed activities should be related to research activities funded in a JRP from iMERA-Plus or an EMRP project selected in 2009 to 2014.
Guardian	Beat.Jeckelmann@metas.ch	Erkki.Ikonen@aalto.fi	Maguelonne.Chambon@lne.fr	Miruna.Dobre@economie.fgov.be	Beat.Jeckelmann@metas.ch	-
Facilitator	Sophie.Vaslin-Reimann@lne.fr	Ian.Severn@npl.co.uk	Eveline.Domini@lne.fr	Tanasko.Tasic@euramet.org	Tanasko.Tasic@euramet.org	Paula.Knee@npl.co.uk

Guide 1: Admissibility and Eligibility for EMPIR Calls

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CONTENTS

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1 Scope

This document details admissibility and eligibility for submissions to EMPIR Calls. The admissibility and eligibility are the minimum conditions which a proposal must fulfil if it is to be evaluated. EURAMET will check the eligibility of each proposal and only eligible proposals will be evaluated. Where eligibility is not met the proposal will be withdrawn and the proposers informed. If ineligibility is discovered at a later time during the evaluation process, the proposal will be withdrawn.

Where there is a doubt on the eligibility of a proposal, EURAMET reserves the right to proceed with the evaluation, pending a final decision on eligibility. The fact that a proposal is evaluated in such circumstances does not constitute proof of its eligibility.

2 Background to the Calls

The European Metrology Programme for Innovation and Research (EMPIR) aims, through European integration, to develop new measurement capabilities that have strategic impact for Europe, with the overall goal of accelerating innovation and competitiveness, generating data and knowledge necessary to improve quality of life, and providing better tools for the scientific community.

2.1 Project types

EURAMET currently issues calls for three types of EMPIR project – Joint Research Projects (JRPs), Joint Network Projects (JNPs) and Support for Impact Projects (SIPs).

JRPs are “Research and Innovation Actions” in Horizon 2020 terms, which are defined as:

> “Actions primarily consisting of activities aiming to establish new knowledge and/or to explore the feasibility of a new or improved technology, product, process, service or solution. For this purpose they may include basic and applied research, technology development and integration, testing and validation on a small-scale prototype in a laboratory or simulated environment. Projects may contain closely connected but limited demonstration or pilot activities aiming to show technical feasibility in a near to operational environment.”

JNPs and SIPs are “Coordination and Support Actions” in Horizon 2020 terms, which are defined as:

> “Actions consisting primarily of accompanying measures such as standardisation, dissemination, awareness-raising and communication, networking, coordination or support services, policy dialogues and mutual learning exercises and studies, including design studies for new infrastructure and may also include complementary activities of strategic planning, networking and coordination between programmes in different countries.”

3 Admissibility

To be considered admissible, a submission to the programme must be:

- submitted following the instructions given on http://msu.euramet.org/ before the deadline specified;
- readable, accessible and printable;

Incomplete proposals may be considered inadmissible. A complete proposal includes the requested administrative data, the proposal description, and any supporting documents specified in the call.

The instructions given on http://msu.euramet.org/ will include page or character limits for some sections. Evaluators will be instructed to disregard any excess text.

4 Eligibility to submit at Stage 1 of a two stage call

In EMPIR a two stage call is not a call for pre-proposals followed by a call for full proposals. Instead the first stage is a call for the submission of needs for metrology research or networks. The submissions should come from those that would benefit from a particular research or network activity rather than those proposing to form a consortium to carry out the activity. EURAMET combines different submissions at Stage 1 into the specification documents they issue at Stage 2. Consortia then form to develop and submit a proposal against those specifications.

For a Stage 1 Call, submissions are welcome from any person or organisation worldwide. There are no eligibility requirements; merely the admissibility requirement's given above.

5 Participation in EMPIR Projects

5.1 Internal Funded Partners

The EURAMET National Metrology Institutes (NMIs) and Designated Institutes (DIs), from countries that have made a financial commitment to the Programme, can participate in projects as "Internal Funded Partners"[1].

Legal entities of the Designated Institutes will be treated as internal funded partners when they participate in the project fully or partly in the area of designation of the DI.

Internal Funded Partners will receive a flat rate for indirect costs of 5 %, rather than the 25 % for External Funded Partners.

5.2 External Funded Partners

All other legal entities established in:

- The Member States of the European Union, including their overseas departments
- The Overseas Countries and Territories (OCT) linked to Member States
- The countries automatically eligible for Horizon 2020 funding
- The countries associated to Horizon 2020

can be External Funded Partners. These countries are identified in List 1b.

The legal entities of EURAMET DIs from countries that have made a financial commitment to the Programme, will be treated as external funded partners (eligible to the 25 % flat rate for indirect costs) when they participate in the project outside of the area of designation of the DI. In case the legal entity participates both within the area of designation and outside this area within the same project, it will be treated as an "internal funded partner" and will only be eligible to the 5 % flat rate for indirect costs.

International European interest organisations can also be External Funded Partners.

Other organisations whose participation is essential to particular projects may be funded at the discretion of EURAMET. EURAMET consider the International Bureau of Weights and Measures (BIPM), the World Meteorological Organisation (WMO), and the International Atomic Energy Agency (IAEA) to be likely candidates for this discretion.

External Funded Partners will be funded at the same rate that they would receive in Horizon 2020 research projects. This includes the EURAMET NMIs and DIs that participate as External Funded Partners because their country has not made a financial commitment to the EMPIR programme.

5.3 Linked Third Party

A Linked Third Party:

- Is an organisation which is not considered as an Internal Funded Partner or an External Funded Partner (i.e. those who sign the Grant Agreement), but makes some contributions to the JRP.
- Is an organisation "linked" to a funded partner. The term "linked" refers to an established formal relationship between a Third Party and the funded partner, defined by the following characteristics:
    - The relationship to the funded partner by nature is broad and is not limited to the Grant Agreement.
    - Accordingly, its duration goes beyond the duration of the JRP and usually pre-dates and outlasts the JRP.
- It has a formal external recognition, sometimes in the framework of a legal structure.

[1] List 1a gives the legal entity details for the EURAMET NMIs and DIs. List 1b indicates the countries that have made a financial commitment to EMPIR.

- Can charge costs under certain conditions, otherwise resources provided 'free of charge' may be viewed as a 'receipt'.
- Can contribute to the project in two possible ways:
    - making resources available to a funded partner in order for the funded partner to be able to carry out part of the work (does not perform work), or
    - by carrying out part of the work itself.

In all cases, the funded partner retains sole responsibility for the work of the Linked Third Party and has to make sure that the Linked Third Party complies with the provisions of the Grant Agreement.

If you think you will need to include a Linked Third Party, please email msu@npl.co.uk or call the MSU for advice.

5.4 Unfunded Partner

Legal entities that are not eligible to be Internal Funded Partners or External Funded Partners may participate in EMPIR Projects as Unfunded Partners. Unfunded Partners deliver work necessary for the completion of the project, they submit their estimated costs as part of the proposal, and sign the Grant Agreement, but receive no funding from EURAMET.

Legal entities that are eligible to be Internal Funded Partners or External Funded Partners may choose to participate in EMPIR Projects as Unfunded Partners and EURAMET would consider this as particularly appropriate where an industrial partner would receive a significant benefit from its participation.

6 Eligibility requirements for consortia

A consortia proposing and delivering a JRP must consist of at least 3 Internal Funded Partners from different countries, one of which acts as the project coordinator.

A consortia proposing and delivering a JNP or SIP must consist of at least 1 Internal Funded Partner which acts as the project coordinator.

7 Related issues

7.1 Collaborators

Legal entities that do not sign the Grant Agreement or deliver any work necessary for the completion of the project, but have a formal relationship with the consortia (e.g. a non-disclosure agreement) are regarded as Collaborators. They are not regarded as partners or participants in the project.

7.2 The position of the JRC

In previous European Research Programmes implemented by EURAMET the Joint Research Centre of the European Commission (JRC) has been eligible to participate on the same terms as an NMI of an EU Member State. That position is reversed in EMPIR and the JRC would join a project as an External Funded Partner or an Unfunded Partner.

7.3 Legal entity validation

All partners in an EMPIR project must be a legal entity to be able to sign a Grant Agreement with EURAMET. While EURAMET is responsible for validating the legal status of organisations, it also requires them to register in the European Commission's Beneficiary Register[2] (previously known as the Unique Registration Facility (URF)). Any organisation can register on the European Commission's Beneficiary Register, which immediately allocates a PIC (Participant Identification Code) number. The PIC does not have to be "validated" by the European Commission Services, but if it is then EURAMET will take this into account in its own validation process.

[2] http://ec.europa.eu/research/participants/portal/desktop/en/organisations/register.html

7.4 Financial capacity checks

EURAMET will carry out Financial Capacity Checks on the organisations receiving funding in EMPIR projects as it is responsible to the Commission for any European funding that it fails to recover when necessary. Financial Guarantees may be required from some External Funded Partners.

7.5 Operational capacity

EURAMET is required by the Horizon 2020 Rules for Participation to assess the Operational Capacity of all partners in a proposal to deliver EMPIR projects. This will be part of the evaluation process and carried out by the referees. A section of the proposal template will ask for information on each partner that will allow the referees to make a judgement on the operational capacity of each partner to do the work proposed.

Guide 4: Writing Joint Research Projects (JRPs)

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CONTENTS

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1 Scope

This document explains how to write a Joint Research Project (JRP) proposal for an EMPIR Call. It includes information on how to complete the templates and submit your proposal, and examples to help you write your proposal.

It does not include information on:

- eligibility, this is described in Guide 1: Admissibility and Eligibility for EMPIR Calls
- resourcing and costing a proposal, this is described in Guide 5: Submitting Administrative Data for EMPIR Projects
- evaluating a proposal, this is described in Guide 6: Evaluating EMPIR projects

2 Submission

You should submit your JRP proposal electronically via the Call webpages https://msu.euramet.org/calls.html before the Call deadline. For each complete proposal, the following documents must be combined as a single ZIP file and submitted:

1. Template 4: JRP protocol (required)
2. Template 5: Project Administrative Data (required)
3. Letters of support (optional). These should be collated together as a single unsecured pdf file, which should not exceed 6 MB in size. Please note that letters of support submitted in an unsuitable format will not be provided to the referees by EURAMET.

*** While a letter of support from the Chief Stakeholder for Pre and Co-Normative proposals is not a formal eligibility requirement, their expressed need sets the context for the evaluation of the proposal. Therefore, a letter from the Chief Stakeholder explaining that need, how their organisation will make use of the outcomes from the research, and be consulted regularly by the consortium during the project to ensure that the planned outcomes are still relevant, is very important information for the referees.*

This document includes size limits for some sections of your JRP proposal, the referees will be instructed to ignore any text over these limits.

If you wish to make corrections or amendments, you should resubmit a complete set of documents as a new ZIP file via the online submission system, indicating the original submission reference number.

Proposers should note that no other documents should be submitted, and any that are, will not be passed to the referees by EURAMET.

3 Participants

You can identify and select your project participants in any way you choose, however EURAMET has created an online tool Connections https://msu.euramet.org/ to help potential participants find one another.

If you want to join or form your own consortium, we strongly recommend that you add the details of your capabilities to the Connections website.

JRPs may include four types of project participant

1. Internal Funded Partner(s)
2. External Funded Partner(s)
3. Unfunded Partner(s)
4. And rarely, Linked Third Parties

If you think you will need to include a Linked Third Party, please email msu@npl.co.uk or contact the EURAMET Management Support Unit (MSU) for advice.

The eligibility criteria for each type of participant are described in Guide 1: Admissibility and Eligibility for EMPIR Calls. EURAMET will also make further checks to establish eligibility prior to issuing contracts.

Please note that for Pre and Co-Normative Calls EURAMET encourages proposals that include representatives from industry, regulators and standardisation bodies actively participating in the projects. The proposal must also 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.

4 Completing the JRP protocol

All sections of Template 4: JRP protocol, are mandatory, unless otherwise stated, and should be completed as detailed in the sections below.

The page limits given for a section MUST be adhered to using Arial font size 10. If the page limits are exceeded (for a section) then referees will be asked to disregard the text/information that is over the page limit. The mandatory page limits are summarised in the table below:

Section or sub-section	Maximum length
B1.a: Summary of the project	3.5 pages
B2.a: Projected early impact on industrial and other user communities	1 page
B2.b: Projected early impact on the metrological and scientific communities	0.5 pages
B2.c: Projected early impact on relevant standards	0.5 pages (excluding the table)
B2.d: Projected wider impact of the project	1.5 pages
B2.e: Data management	1 page
B3.a: Overview of the consortium	1.5 pages for up to 15 partners, 2 pages for up to 20 partners, 2.5 pages for up to 25 partners

4.1 Title page

Please complete and remove the <>, and ensure that the data is consistent with that in Template 5: Project Administrative Data. The JRP number and title must be the same as the SRT number and title. If your proposal is selected for funding it will be issued with a new JRP number and you may revise the title during grant preparation (if required). You should include a proposed short name/acronym for your JRP (a maximum of 13 characters including spaces) and ensure that the proposed short name is consistent between Template 4 and Template 5: Project Administrative Data.

Please do **not** delete the automatic footers from Template 4: JRP protocol.

4.2 Glossary

A Glossary is optional and, if required, should be included before the table of contents.

4.3 Section A: Key data

4.3.1 Section A1: Project data summary and Section A2: Financial summary

In order to help proposers capture the necessary data, reduce duplication of data, and minimise errors, EURAMET have created Template 5: Project Administrative Data (an Excel workbook). The data entered in Template 5 automatically populates a number of worksheets containing tables that you should copy and paste into Section A1 and Section A2 in Template 4: JRP protocol.

Pasting tables from Template 5 into Section A1 and Section A2 in Template 4: JRP protocol		
Template 5 Worksheet	**Template 4: JRP protocol Section A tables**	**Notes**
A	Section A1 Coordinator contact details	Select the right hand column inside the table and copy. Ctrl V or Paste Special as “Formatted Text”. Do not paste as “Picture”

A	Section A1 Chief Stakeholder contact details *** only for Pre and Co-Normative proposals*	For Pre and Co-Normative proposals select the right hand column inside the table and copy. Ctrl V or Paste Special as “Formatted Text”. Do not paste as “Picture”. For all other proposals the ‘Chief Stakeholder’ table and heading should be deleted.
B	Section A1 Participant details	Select the area inside the table and copy (excluding the column and row headings). Ctrl V or Paste Special as “Formatted Text”. Do not paste as “Picture” Please delete any empty rows in the tables. If your project does not include Linked Third Parties then “table b. Linked Third Parties” should be deleted.
C	Section A2 Financial summary	Select the area inside the table and copy (excluding the column and row headings). Ctrl V or Paste Special as “Formatted Text” those cells that include data. Do not paste as “Picture” or re-paste the column or row headings. If your proposal includes any subcontracting, include one or two sentences under the A2 table explaining what will be subcontracted and why.

4.3.2 Section A3: Work packages summary

The information should be consistent with the work packages in Section C of Template 4: JRP protocol and the “WP months data entry” worksheet in Template 5: Project Administrative Data.

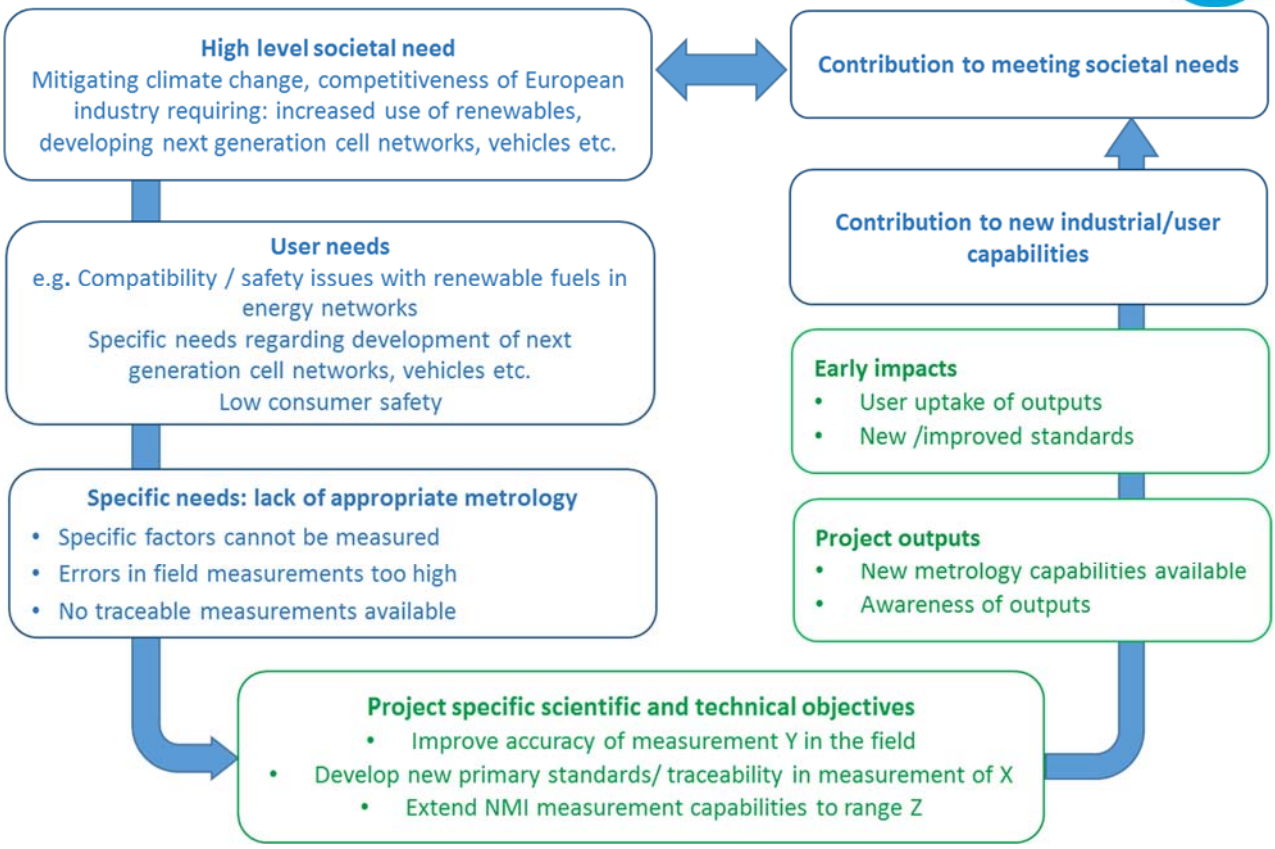
If your project includes a Linked Third Party you must include the following sentence under the work packages summary table “Some of the staff working on the project at YYY are employed by the Linked Third Party NNN. NNN will provide N months of labour resource overall to this project in WPX, WPY and WPZ. This resource is included in the table above.” and you must identify the number of person months the Linked Third Party will provide to each WP.

4.4 Section B: Overview of the research

Section B should be used to explain how your project addresses each of the 3 evaluation criteria (“Excellence”, “Impact” and “Quality and Efficiency of the Implementation”). Proposers should therefore take note of the evaluation criteria (see Section 5.1).

Section B should tell a coherent story about the proposed project which should follow a logical flow from the high-level needs (e.g. to contribute to mitigating climate change, improve productivity in sector X), through to the specific user needs (problems encountered in specific types of companies or public agencies) that need to be addressed, through into the objectives of the project and the project outputs, then explain how the project’s outputs will be used to generate the early impacts addressing the stakeholders’ needs, and how this will subsequently contribute to addressing the top level needs or drivers (see diagram below). The links between these different aspects should be clearly explained and the early impacts and benefits you describe should be specifically attributable to the outputs and aims of the project.

Please do not include any photographs in Section B. Diagrams should only be included if absolutely necessary and should be limited to one or two schematic diagrams. In addition, do not include lists of references in Section B. Lists of references should only be included in Sections E and G, as appropriate (see Sections 4.13 and 4.15).



4.5 Section B1: Scientific and/or technical excellence

4.5.1 Section B1.a: Summary of the project

This section should be aimed at a non-specialist audience and must cover the need for the project, its objectives, its key technical outputs (what it will achieve), and the wider benefits to end users and society (who will be using the outputs). The summary of the project should be a standalone and self-contained summary that can be read and understood without reading any other sections from the proposal.

The summary of the project should be no more than 3.5 pages in length and should have the following subsections with subheadings:

Subsection	Content
Overview (50-100 words)	This section should explain in two or three sentences the purpose of the project. It should state a high-level overview of the project including the overall need and how the project will address this need and its measurement challenge(s).
Need (150-300 words)	This section should explain why the project is being undertaken. It should clearly explain (to a non-specialist audience) why better measurements are needed and who needs them. It should clearly link to the project's scientific and technical objectives and explain the need for each of them. Where relevant, refer to European legislation, documentary standards, technology roadmaps etc. Your description should follow a logical flow from the high-level needs, through to the specific user needs that needed to be addressed via improved measurement capabilities. For example: • State the high-level societal need for the project, such as improving the competitiveness of European industry, mitigating the effects of climate change, or tackling global health issues. • Describe the overall need(s) of the end-users in simple language, such as new product development, improved process control, or compliance with regulation(s). Explain the specific measurement needs/problems faced by end-users, such as particular variables that can't be measured, or problems caused by a lack of traceability.

Objectives (150-300 words)	This section presents the objectives (including the impact objective) for the project. To give some context for the objectives, please begin with the overall goal of the project in one simple sentence.
Progress beyond the state of the art and results (300-500 words)	This section should describe how the project will progress beyond the state of the art and the expected final technical outputs (results) of the project. This should be done for each objective (except the impact objective). If your JRP directly continues and develops the work undertaken in a previous project please summarise the conclusions from that project.
Impact (400-1000 words)	This section should describe the impact the project is expected to have and the route from project outputs to impact. To do this please explain how the project will make a tangible contribution to addressing specific user needs (who the expected end users will be) and how this will in turn contribute to wider and longer-term impacts. The section should have the following subsections: • *Impact on industrial and other user communities* Summarise how relevant user communities e.g. in industry and in the public sector plan to uptake, exploit and use research outputs (e.g. new measurement capabilities, reference standards, devices, new knowledge, etc.). The text can be based on Section B2.a. • *Impact on the metrology and scientific communities* Summarise the direct effect your project will have on the metrological and scientific communities e.g. significant advances in the SI system or proposed changes to NMI/DI Calibration and Measurement Capabilities. The text can be based on Section B2.b. • *Impact on relevant standards* Summarise the impact your project will have on new or existing documentary standards that support the creation of the wider impacts. The text can be based on Section B2.c. • *Longer-term economic, social and environmental impacts* For the wider impacts, please explain the economic, social and environmental impact that your project will make across Europe (and internationally). You should provide details of who will benefit from the project, and which aspects of the project, stakeholder groups will benefit from. The text can be based on Section B2.d.

Please note that a preliminary Publishable Summary will be required for successful proposals and EURAMET will ideally use the summary in section B1.a for that purpose. You should therefore exclude any confidential material and SRT references from the summary. The Publishable Summary will not include a list of references nor a glossary, hence any key reference documents should be detailed in full in the summary and any abbreviations should be explained.

Example B1.a: Summary of the project (Industry project)

Overview
The overall aim of this project is to enable the SI traceable measurement of absolute, positive and negative gauge pressure in the intermediate pressure range from approximately 1 Pa to 10^4 Pa. Relevant industries will be targeted such as power plants, cleanroom technologies, petrochemical and pharmaceutical production and the storage of nuclear and toxic wastes, in order to support innovation and efficiency in industrial production and processes. This project will include the production of primary and transfer standards for dissemination of the pressure scale and the development of appropriate calibration methods for high-accuracy state-of-the-art pressure devices in order to establish a calibration service in this pressure range.

Need
SI traceable measurement of absolute, positive and negative gauge pressure in the intermediate range is important for industries such as power plants, cleanroom technologies, petrochemical and pharmaceutical production and the storage of nuclear and toxic wastes. Reliable, accurate, traceable pressure measurements are needed for such industries as they are subject to strict international requirements with respect to safety, precision, sterility and performance. Therefore, to ensure traceability of measurements with sufficient accuracy to meet the demands of industry, high-accuracy primary standards for disseminating the pressure scale in the intermediate range (from approximately 1 Pa to 10^4 Pa) need to be developed.

Low absolute, differential, positive and negative gauge pressure measurements all play a vital role in numerous industrial processes that demand high accuracy of positive and negative gauge pressure measurements at all stages of the traceability chain. Conventional calibration procedures applied to instruments for low differential pressures are also extremely dependent on weather conditions, especially the stability of atmospheric pressure; and often the target uncertainty level cannot be achieved. Therefore this project will develop alternative calibration approaches and techniques to ensure a constant low uncertainty, independent of ambient conditions. Moreover, the project will establish a high-accuracy calibration service.

Further to this, the EU mercury strategy includes a comprehensive plan addressing mercury pollution both in the EU and globally. In addition, the amendment of Annex XVII to Regulation (EC) No 1907/2006 by the Commission Regulation (EU) No 847/2012 on 19/9/2012 restricts the use of mercury in barometers and sphygmomanometers for industrial and professional use from 10 April 2014. This project will support the replacement of primary mercury manometers which are still in use in many research institutions and reference laboratories.

Objectives

The overall goal of this project is to enable the SI traceable measurement of absolute, positive and negative gauge pressure in the intermediate pressure range from approximately 1 Pa to 10^4 Pa with an accuracy level of $3\times10^{-5}\ p$ + 0.005 Pa in order to increase the efficiency of industrial productions and processes. The specific objectives of the project are:

1. **To develop and characterise primary and transfer pressure standards -** for the realisation and dissemination of the pressure scale in the intermediate range 1 Pa to 10^4 Pa. This will enable comparisons with both primary high pressure standards, e.g. dead-weight pressure balances and liquid column manometers, and primary vacuum standards, usually static and continuous expansion systems.
2. **To develop calibration methods for positive and negative gauge pressure standards in the range from approximately -10^5 Pa to 10^4 Pa** - in order to reduce the uncertainty of the pressure calibration down to $3\times10^{-5}\ p$ + 1 Pa independent of variable ambient conditions, and in industrial conditions to better than $2\times10^{-4}\ p$ + 3 Pa. This will enable accurate calibrations with a high level of accuracy that is independent of variable ambient conditions.
3. **To meet the EU restrictions of mercury use in measuring devices (barometers)** - replacement of primary mercury manometers with alternative pressure standards.
4. **To establish a calibration service in the range of approximately -10^5 Pa to 10^4 Pa of gauge pressure and approximately 1 Pa to 10^4 Pa of absolute pressure** – with an accuracy level sufficient for accredited calibration laboratories and industrial companies. This will be achieved by the development of state-of-the-art pressure measurement instrumentation such as force-controlled piston gauges with a resolution of 1 mPa.
5. **To engage with industries that utilise pressure in the intermediate range 1 Pa to 10^4 Pa** - facilitating the uptake of the technology and the measurement infrastructure developed by the project.

Progress beyond the state of the art and results

Primary and transfer pressure standards for dissemination of the pressure scale in the intermediate range

Primary pressure standards - dead-weight pressure balances and liquid column manometers - enable the pressure unit to be established in terms of the SI units kilogram, metre and second and traceability to be disseminated. The lower operating range of the dead-weight pressure balance is limited to approximately 5 kPa. The lowest pressure accurately measured with mercury manometers is approximately 1 kPa. Oil is an advantageous alternative to mercury due to its low density, low vapour pressure and much better stability of the free surface, but is not widely used because of a relatively large variation of the oil density with pressure. The project will go beyond this by the *in situ* measurement of oil density in a novel oil micromanometer.

New force-balanced piston gauges (FPGs) allow gauge and absolute pressures to be accurately measured from 15 kPa downwards to zero, but have only been used as secondary standards so far. This project will go beyond this by developing appropriate 3D flow models taking into account the molecular properties of gas. By combining these models with dimensional measurements carried out on piston-cylinders, for the first time their effective area will be determined as a function of variable pressure conditions. In this way the FPGs will be characterised as primary pressure standards.

Calibration methods for positive and negative gauge pressure standards in the range from approximately -10^5 to 10^4 Pa

To solve the problem of limited accuracy pressure calibrations due to unstable ambient conditions, new procedures and techniques will be developed for low differential pressures calibrations. This will reduce the calibration uncertainty down to $3\cdot10^{-5}\times p$ + 1 Pa independent of variable ambient conditions and which will benefit accredited and industrial calibration laboratories.

EU restrictions of mercury use in measuring devices (barometers)

Mercury manometers are operated by very few European NMIs nowadays, but are still used by numerous calibration, industrial and research laboratories. European Commission Regulations restrict the use of mercury in barometers and sphygmomanometers for industrial and professional use. This project will enable users of mercury-containing pressure devices to meet the restrictions on the use of mercury in pressure measurements by identifying and evaluating alternative approaches. Within the project, two strategies will be followed: firstly investigation of alternative standards based on refractometry techniques, and secondly comparisons between mercury-containing and existing mercury-free pressure standards. The comparisons will be used to specify conditions and methods with which the alternative pressure standards have comparable or even better measurement capabilities than those of mercury manometers.

Calibration service in the range of approximately -10^5 Pa to 10^4 Pa gauge pressure and approximately 1 Pa to 10^4 Pa absolute pressure

Advanced FPGs, which accurately measure pressure in the range 15 kPa downwards to zero, can only be calibrated against dead-weight pressure balances or mercury manometers at pressures above a few kilopascals. Below these pressures, there are no alternative pressure standards. Therefore, by developing new reference pressure standards and calibration methods an adequate calibration service in Europe will be provided by this project. Currently, the traceability for industrial calibration services in the range of approximately -10^5 Pa to 10^4 Pa gauge pressure and approximately 1 Pa to 10^4 Pa absolute pressure is insufficient. Thus this project will develop a calibration service better than $2\cdot10^{-4}\times p$ + 3 Pa under industrial conditions.

Impact

The project will impact many industries such as power plants, cleanroom technologies, petrochemical and pharmaceutical production, and the storage of nuclear and toxic wastes. It will also improve the reliability and accuracy of low gauge, differential and absolute pressure measurements at NMIs, accreditation laboratories and with end users.

Impact on industrial and other user communities

The project will establish a new primary standard and support the dissemination of the pressure scale in the intermediate pressure range 1 Pa to 10^4 Pa. This will improve the reliability and accuracy of low gauge, differential and absolute pressure measurements at many levels from NMIs, to accredited commercial laboratories, to the end users. This traceability is the basis for more accurate pressure measurement (e.g. for the cleanroom technologies and processes) and will allow realisation of tighter tolerances of non-equilibrium conditions and, as a consequence, reduce energy consumption and costs without the loss of safety, sterility and precision. The costs of operations involving toxic and nuclear materials as well as the storage of environmentally dangerous toxic and nuclear wastes should also be reduced and the safety of these processes increased.

The project will also establish an improved calibration service that will provide end-users with access to calibrations in the range 0 Pa to 15 kPa absolute pressure with uncertainties at the level $3 \cdot 10^{-5} \times p + 5$ mPa. Such conditions will be beneficial for example for more efficient and safe use of airspace by aircraft and will provide access to improved capabilities for national and accredited laboratories in Europe and support consistency in measurement capabilities.

The project's outcomes will be disseminated to calibration laboratories and industrial stakeholders such as manufacturers of pressure measuring devices by organising workshops and presenting the project's results at conferences and in scientific journals. At least one international and one national workshop aimed at collaborators and stakeholders will be organised by the project for the measurement and traceability issues in the gauge and absolute pressure ranges below 15 kPa, improvement of pressure measurement accuracy under variable ambient atmospheric conditions and industrial environment. Knowledge will also be disseminated to end users through training courses and an advisory group consisting of industrial stakeholders will be established and will meet regularly to exchange information with the consortium and to ensure that the project is delivering relevant outputs and information for end users. The participation of industrial partners in the project will also help to align the project with industrial needs.

Impact on the metrological and scientific communities

Based on the project's results, a recommended *mise en pratique* for assuring traceability in the range 1 Pa – 15 kPa using FPGs in both absolute and gauge mode will be developed. This will create a large impact on calibration laboratories and will be presented to the accreditation authorities in Europe as well as to end users and manufacturers of FPGs.

In the area of FPGs, knowledge transfer from experienced NMIs to those less experienced on how to use this new type instruments will be very beneficial. On a broader scope, the project will strengthen the collaboration of European NMIs and will increase their competitiveness and consistency by producing a draft calibration guide for the use of FPGs in both absolute and gauge mode (to be submitted to EURAMET for publication).

Further to this, improved calibration methods for positive and negative gauge pressure standards in the range from approximately -100 kPa to 15 kPa will be developed. A calibration guide for positive and negative gauge pressure standards will be drafted that will describe different calibration systems, conditions under which they are to be operated, procedures to be followed, the target uncertainties and the best working practices. The draft guide will be submitted to EURAMET and made available to end users.

Impact on relevant standards

The project will contribute to the implementation of European Commission Regulation (EU) No 847/2012 which restricts the use of mercury in barometers and sphygmomanometers for industrial and professional use. The execution of the Regulation will be facilitated by providing equivalent alternative non-mercury based pressure standards. It will also support the reduction in the number of mercury-containing pressure-measuring devices in Europe. In addition, the consortium will promote the results of the project within the standardisation community and will provide input into the standardisation process e.g. CCM WG P (Pressure), COOMET TC 1.6 "Mass and related quantities", DIN NATG-D Standard Committee Technical Basics - pressure, flow, temperature and IMEKO TC 16 "Pressure and Vacuum Measurement". For ISO, the standards relevant to the project that are in preparation/revision will be identified, and the work on these standards will be suggested to the appropriate working groups or committees.

Longer-term economic, social and environmental impacts

By improving the pressure scale at the NMI level in the range of lower gauge, absolute and differential pressure this project will provide a better measurement capability. In combination with new calibration methods, a more adequate dissemination of the unit "pressure" will also be obtained. Further to this, European calibration laboratories and industry should be able to engage with the new calibration services and to have their instruments calibrated within Europe without the need to send their devices to the US. This will meet the demand of industry to obtain high accuracy calibration services in Europe, whilst making calibrations less time and cost consuming.

The European mercury strategy [Commission Regulation (EU) No 847/2012 on 19/9/2012] restricts the use of mercury in barometers from 10 April 2014 which is an issue for research institutions and reference laboratories in the avionic industry and weather monitoring and forecast services, which all use mercury barometers. Many European NMIs also realise the pressure scale on low gauge, absolute and differential pressure using mercury based liquid column manometers and these devices usually contain 6 kg to 10 kg of mercury. Therefore, a new primary standard, using alternative manometric liquids such as oil, will fulfil the EU demands and reduce the risk of accidental environmental pollution by mercury.

As mentioned, many industries such as pharma-biotech, semiconductor, micro- and nano-technology, petrochemical, aviation, energy production, weather monitoring and forecast services will benefit from the project's output and this should strengthen the European industrial infrastructure for the development of new services and products (that rely on pressure). As a wider impact, Europe's innovative capacity should be increased, leading to higher employment and wealth for society. Finally, the project will improve collaboration between European NMIs, in particular, between smaller/less experienced NMIs and more experienced NMIs.

4.5.2 Section B1.b: Overview of the scientific and technical objectives

This section should describe the scientific and technical objectives of your project and it should be approximately half a page. A numbered list is required for your objectives and you should indicate which work package(s) address each objective. Objectives should be quantified e.g. parameters, ranges, materials and target uncertainties included where applicable. The list of specific objectives should be preceded by a sentence at the start of the section describing the overall aim of the project.

The description of the scientific and technical objectives should align with those in Section B1.a and with the SRT objectives. They may be the same as the SRT objectives, or they may be slightly revised or refocused. However, if there is a divergence from the SRT objectives, please:

- Identify any SRT objectives or parts of objectives that the proposed project does not address and explain why.
- Explain why any additional scientific and technical objectives (i.e. that are not part of the SRT objectives) are included.

Example 1: B1.b: Overview of the scientific and technical objectives (Environment project)

The overall objective of this project is to enable the SI traceable monitoring of radon (222Rn) at low radon activity concentrations including calibration and radon mapping, in particular in support of the European Council Directive 2013/59/EURATOM (EU BSS). The project will contribute to the creation of a coordinated metrological infrastructure for radon monitoring in Europe.

The specific objectives of the project are:

1. To develop novel procedures for the traceable calibration of radon (222Rn) measurement instruments at low activity concentrations (100 Bq/m3 to 300 Bq/m3) with relative uncertainties ≤ 5 % (k=1). As part of this, to develop new radioactive reference sources with stable and known radon emanation rates (WP1).
2. To investigate and to reduce the influence of thoron (220Rn) and its progeny on radon end-user measurements and radon calibrations (WP2).
3. To compare existing radon measurement procedures in different European countries and from the results optimise the consistency of indoor radon measurements and soil radon exhalation rate measurements across Europe (WP3).
4. To analyse and develop methodologies for the identification of radon priority areas (i.e. areas with high radon concentrations in soil, as defined in the EU BSS), including the development of the concept of a Radon Hazard Index (RHI), and to investigate the relationship between soil radon exhalation rates and indoor radon concentrations (WP4).
5. To validate traceability of European radon calibration facilities, and to publish guidelines and recommendations on calibration and measurement procedures for the determination of radon concentration in air (WP5).
6. To facilitate the take up of the technology and measurement infrastructure developed by the project by end users (regulators, radiological protection bodies and policy makers), standards developing organisations (ISO/TC45, CEN/TC351, ISO/TC85, CENELEC/TC 45, IAEA) and the measurement supply chain (accredited laboratories, instrumentation manufacturers).

Example 2: B1.b: Overview of the scientific and technical objectives (Research Potential project)

The overall objective of this project is to develop reproducible calibration methods and measurement uncertainty evaluation models for different groups of AWIs, which operate in a dynamic mode. The project also aims to increase expertise among EURAMET members in the provision of reliable traceability of automatic weighing instruments. The specific objectives of the project are:

1. **To develop and validate appropriate measurement methods for the calibration of the 3 selected categories of AWIs** (automatic catchweighers, automatic instruments for weighing road vehicles in motion and automatic gravimetric filling instruments). The results obtained using the new methods for calibration of AWIs operating in the dynamic mode will be compared with the static weighing of objects. The key elements of the specific content of a calibration certificate for calibration of an AWI will be defined. The reproducibility of methods developed will be confirmed by comparison of the dynamic weighing measurements performed by the partners. (WP1, WP2)
2. **To develop and validate error models for the dynamic weighing process** for these 3 categories of automatic weighing instruments and to determine the potential sources of measurement uncertainty for these instruments. (WP1, WP2)
3. **To develop uncertainty budgets for the determination of the uncertainty of measurement for the calibration of AWIs and for the determination of the uncertainty of a weighing result**. The uncertainty budgets will be validated by comparisons and cross-checked with static methods. (WP1, WP2)
4. **To develop 3 draft calibration guides; one for automatic catchweighers, one for automatic instruments for weighing road vehicles in motion and one for automatic gravimetric filling instruments** respectively and to submit them to EURAMET for approval either as three separate EURAMET Calibration Guides or as one combined Guide. (WP1, WP4)
5. **To develop an individual strategy for each participant for the long-term operation of the capacity developed, including regulatory support, research collaborations, quality schemes and accreditation**. Also to develop a strategy for offering calibration services from the established facilities to their own country and neighbouring countries. The individual strategies will be discussed within the consortium and with other EURAMET NMIs/DIs, to ensure that a coordinated and optimised approach to the development of traceability in this field is developed for Europe as a whole. (WP3)

Example 3: B1.b: Overview of the scientific and technical objectives (Normative project)

The overall objective of the project is to develop traceable measurement and characterisation methods for use in the standards being developed by ISO TC 197 "Hydrogen Technologies" and related groups. The specific objectives of the project are:

1. To provide a substantial contribution to the revision of standards in the ISO 14687 series (Hydrogen fuel - Product specification) in fuel cell applications for road vehicles. The contribution to be focused on measurement methods for the characteristics of hydrogen fuel in order to assure uniformity of the hydrogen product as produced and distributed. (WP1)
2. To provide a substantial contribution to the development of EN 16726 (Gas infrastructure – Quality of natural gas – Group H) by developing traceable measurement methods for the determination of the chemical properties of H_2/natural gas mixtures with different hydrogen levels in the blends. (WP2)
3. To work closely with the European and International Standards Developing Organisations, and the users of the standards they develop, to ensure that the outputs of the project are aligned with their needs, communicated quickly to those developing the standards, and in a form that can be incorporated into standards at the earliest opportunity. (WP3)

4.5.3 Section B1.c: List of deliverables

You should list your deliverables in the table provided in Template 4: JRP protocol. The deliverables should align with the project's scientific and technical objectives in Section B1.b and hence the SRT objectives. There should be a maximum of 10 deliverables including 6-8 technical deliverables (approximately one or possibly two deliverable(s) for each objective) plus a mandatory deliverable for impact and a mandatory deliverable for the completion of the project's reporting.

Deliverable descriptions should include parameters, ranges and target uncertainties where appropriate and must provide evidence of a tangible high-level project output, such as the key output of a work package. Please remember that each deliverable should be able to be sent to EURAMET and stored, and must have been reviewed and approved by the whole consortium before being submitted to EURAMET by the coordinator.

For each deliverable you should also include the number of the activity (e.g. A1.4.5) where the deliverable is delivered to EURAMET in the first column of the deliverable table under the objective number(s).

Example 1: B1.c: List of deliverables (Environment project)

Relevant objective (Activity delivering the deliverable)	**Deliverable number**	**Deliverable description**	**Deliverable type**	**Partners (Lead in bold)**	**Delivery date**
1 (A1.2.5)	D1	Method for the traceable calibration of radon (^{222}Rn) measurement instruments at low activity concentrations (100 Bq/m^3 to 300 Bq/m^3) with relative uncertainties ≤ 5 % (k=1)	Calibration method	**BBB**	M36
1 (A1.4.8)	D2	Report on the influence of thoron on radon monitors used in Europe including (i) procedures for checking their sensitivity to thoron, (ii) recommendations on the construction of radon monitors that are not sensitive to thoron and (iii) technical approaches aimed at reducing thoron-related bias in the radon signal in existing monitors	Report, Recommendations	**CCC**, BBB, AAA, EEE, FFF, GGG, HHH, III	M30
2 (A2.1.4)	D3	Report on indoor and geogenic radon surveys in Europe, including their strategies, the methodologies employed, inconsistencies in the results, and potential methodologies to harmonise data and reduce inconsistencies	Report	**EEE**, AAA, BBB, DDD, III	M24
2 (A2.4.6)	D4	Report on the results from the on-site comparison of indoor radon measurements and geogenic radon measurements under field conditions together with recommendations to	Comparison report	**CCC**, AAA, BBB, DDD, EEE, FFF, GGG, HHH, III	M34

		assist the implementation of the EU-BSS			
3 (A3.3.3)	D5	Guideline on the definition, estimation and uncertainty of radon priority areas (RPA)	Guideline	**FFF**, AAA, BBB, CCC, DDD, EEE, GGG, HHH, III	M27
3 (A3.5.7)	D6	Report on the concept and establishment of a Radon Hazard Index (RHI) including an RHI map of Europe showing areas with high geogenic radon potential and conclusions on the relationships and correlation between indoor Rn concentration and quantities related to geogenic Rn	Report, Map	**FFF**, BBB, GGG, HHH	M34
4 (A4.1.4)	D7	Validation report on the traceability of primary and secondary radon calibration facilities in Europe	Validation report	**EEE**, AAA, BBB, DDD, III	M34
4 (A4.2.4)	D8	Guideline on calibration and measurement procedures for the determination of radon concentration in air	Guidelines	**EEE**, III	M34
5	D9	Evidence of contributions to the EU-BSS and to new or improved international standards and recommendations with a specific focus on ISO/TC85/SC2, CENELEC/TC45, IEC/TC45, IAEA-Nuclear Data, CEN/TC351/WG3, CCRI and EURAMET TC-IR. Examples of early uptake of project outputs by end users	Reporting documents	**CCC**, all partners	M36
n/a	D10	Delivery of all technical and financial reporting documents as required by EURAMET	Reporting documents	**BBB**, all partners	M36 + 60 days

Example 2: B1.c: List of deliverables (Research Potential project)

Relevant objective (Activity delivering the deliverable)	**Deliverable number**	**Deliverable description**	**Deliverable type**	**Partners (Lead in bold)**	**Delivery date**
1 (A1.2.6)	D1	Draft calibration methods for automatic catchweighers, automatic instruments for weighing road vehicles in motion and automatic gravimetric filling instruments	Draft calibration methods	**BBB,** AAA, CCC, DDD, EEE, FFF	M12
2, 3 (A2.2.8)	D2	Report on error models and procedures for evaluation of the measurement uncertainty for automatic catchweighers, automatic instruments for weighing road vehicles in motion and automatic gravimetric filling instruments, including uncertainty budgets for the calibration and weighing result	Report	**EEE**, BBB, CCC, FFF	M15
1, 3 (A3.1.4)	D3	Summary report and analysis for the validation of the draft calibration methods and uncertainty budgets for automatic catchweighers, automatic instruments for weighing road vehicles in motion and automatic gravimetric filling instruments	Summary report	**DDD**, AAA, BBB, CCC	M22
1, 3 (A3.2.5)	D4	Reports for the interlaboratory comparisons of the calibration of automatic catchweighers, automatic instruments for weighing road vehicles in motion and automatic gravimetric filling instruments	Comparison reports	**BBB**, AAA, CCC, DDD, EEE, FFF	M28

4 (A4.2.5)	D5	3 calibration guides for (i) automatic catchweighers, (ii) automatic instruments for weighing road vehicles in motion and (iii) automatic gravimetric filling instruments	Calibration guides	**DDD**, AAA, BBB, CCC	M33
5 (A5.1.3)	D6	Summary report of the partners establishment of suitable traceability of AWIs which operate in the dynamic mode	Summary report	**AAA**, BBB, CCC, DDD, EEE, FFF	M29
5 (A5.1.5)	D7	Agreed individual strategies for all partners for (a) the long-term development of their research capability in dynamic mass metrology and (b) the provision of calibration services from the established facilities in their own country and / or neighbouring or other countries	Documented strategies	**AAA**, BBB, CCC, DDD, EEE, FFF	M36
4 (A5.3.2)	D8	Email confirmation that the draft calibration guides for automatic catchweighers, automatic instruments for weighing road vehicles in motion and automatic gravimetric filling instruments have been submitted to EURAMET TC-M for approval as EURAMET Calibration Guides	Email	**FFF,** AAA, BBB, CCC, DDD, EEE	M36
4, 5	D9	Evidence of contributions to or influence on new or improved international guides, recommendations and standards with a specific focus on the following guides and committees: EURAMET guide *Calibration of automatic weighing instruments*, EURAMET TC-M, WELMEC Committee, WELMEC WG2 and WG6, OIML TC9/SC2 and CECIP. Examples of early uptake of project outputs by end-users	Reporting documents	**AAA**, all partners	M36
n/a	D10	Delivery of all technical and financial reporting documents as required by EURAMET	Reporting documents	**AAA**, all partners	M36 + 60 days

Example 3: B1.c: List of deliverables (Normative project)

Relevant objective **(Activity delivering the deliverable)**	**Deliverable number**	**Deliverable description**	**Deliverable type**	**Partners (Lead in bold)**	**Delivery date**
1 (A1.1.6)	D1	Calibration procedures for quadrupole mass spectrometers (QMS), specified for different end user use of QMS	Calibration procedures	**CCC**, AAA, DDD, BBB	M24
1 (A1.3.4)	D2	Report on the intercomparison of different QMS from different manufacturers, including recommendations for a standardised procedure for general characterisation of the QMS	Comparison report	**CCC**, AAA, DDD, BBB	M30
1, 3 (A1.4.4)	D3	Letter from ISO TC 112 confirming that the results from JRP NRM99, related to QMS, have been incorporated in an approved Technical Specification TS 20175	Letter from the Technical Committee	**CCC**, AAA, DDD, BBB	M36
2 (A2.1.7)	D4	Report on a standardised measurement procedure and a statement of uncertainty for partial and total outgassing rate measurements	Report	**BBB,** III	M32
2, 3 (A2.2.8)	D5	Letter from ISO TC 112 confirming that the results from JRP NRM99, related to outgassing rate measurements, have been incorporated in an approved	Letter from the Technical Committee	**BBB**, III	M36

		Technical Specification for TS 20177			
4 (A3.1.6)	D6	Evidence of contributions to new or improved international standards with a specific focus on, to be submitted to ISO TC 112 WG2 and DIN Technical Committee "Vacuum Technology" Examples of early uptake of project outputs by end users	Reporting documents	**CCC**, all partners	M36
n/a	D7	Delivery of all technical and financial reporting documents as required by EURAMET	Reporting documents	**CCC**, all partners	M36 + 60 days

4.5.4 Section B1.d: Need for the project

This section must explain a clear need for the project i.e. why the project is being undertaken. It should be approximately 1–1.5 pages in length and should explain the background to the need for the project, i.e. why improved measurement capability, measurement techniques and better measurements are needed and who needs them.

The explanation of the need for the project should link clearly to the project's scientific and technical objectives and explain the need for each of them. Ideally you should structure the section with a subheading for each objective.

The description should follow a logical flow from the high-level needs (e.g. to contribute to mitigating climate change, improve productivity in sector X), through to the specific user needs (problems encountered in specific types of companies or public agencies) that needed to be addressed via improved measurement capabilities at NMIs/DIs. For Research Potential projects, the needs and drivers for the development of the capability from end users and stakeholders outside the metrology community must be described.

If your project continues the work undertaken in a previous JRP please summarise why further work is needed in this area.

You may also include evidence of support from the "end user" community (e.g. letters of support; see Section 2), but please note that all references to letters of support will be removed during grant preparation, therefore the need should be adequately explained without requiring reference to them.

Where relevant, you should refer to the European legislation, documentary standards, technology roadmaps etc. that need to be addressed. In addition, in SRTs for pre- and co-normative JRPs there may be a requirement for the proposed research to be justified by "clear reference to the measurement needs within strategic documents published by the relevant Standards Developing Organisation (SDO) or by a letter signed by the convenor of the respective TC/WG". In those cases this section must fully explain the need expressed by the SDO, web links to the relevant SDO strategic documents must be provided, and any letter from the convenor of the respective TC/WG included in the letters of support.

For most proposals the need for the research extends beyond the metrology community, so you should clearly identify the potential stakeholder groups. If commercial organisations stand to benefit from the research you should explain why it is appropriate for EMPIR to support this research rather than commercial organisations. Finally, you should explain why bringing together a critical mass of European expertise, will enable progress in this area; and why a non-collaborative approach would be less successful.

Example 1: Section B1.d: Need for the project (Environment project)

Radon is a radioactive, colourless, odourless, tasteless noble gas, which occurs naturally through geological based processes (geogenic) as an intermediate step in the normal radioactive decay chains through which thorium and uranium slowly decay into lead. Radon is produced by the radioactive decay of radium-226, which is found in uranium ores, phosphate rock, shales, igneous and metamorphic rocks such as granite, gneiss, and schist, and to a lesser degree, in common rocks such as limestone. Radon can also occur in ground water - for example, in some spring waters and hot springs. Radon gas is a health hazard and is often the single largest contributor to a person's background radiation dose, but due to differences in local geology, the level of the radon gas hazard differs from location to location. Despite its short half-life of 3.8 days, radon gas from natural sources can accumulate in buildings, particularly in confined or unventilated spaces. As radon decays it produces other radioactive elements known as radon progeny. Unlike gaseous radon, these radon progeny are solids and stick to surfaces, such as dust particles in air, which can then also cause lung cancer if inhaled.

European legislation

The European Council Directive 2013/59/EURATOM (EU-BSS) which lays down basic safety standards (BSS) for protection against the dangers arising from exposure to ionising radiation, evokes new challenges for metrology and radon measurements and calibrations in Europe. EU member states are required to ensure that levels of relevant radon activity concentrations as laid down in the EU-BSS do not exceed 300 Bq/m^3, and are obliged to transpose the EU-BSS into national legislation by 2018 for immediate implementation. According to the Council Directive 2013/59/EURATOM (EU-BSS), European member states are obliged to consider several aspects when preparing their **national radon action plan,** which is a strategy for conducting surveys of indoor radon concentrations. This requires reliable calibration and measurement methods for low radon activity concentrations between about **100 Bq/m^3 and 300 Bq/m^3**. A significant improvement in the metrological infrastructure in Europe in the field of radon calibrations at low activity concentrations is a prerequisite in order to be able to fulfil the EU-BSS requirements.

The EU-BSS will impact a range of stakeholders including those responsible for the transposition of the EU-BSS into national law and its implementation: from regulators and policy makers, professionals designing, performing, evaluating and interpreting radon surveys, radon instrument manufacturers to the construction industry. The construction industry will need to comply with national legislation and regulations related to the EU-BSS whilst their practical experience in implementing building codes is crucial in the assessment of its impact on society. Since national radon action plans (a major requirement of the EU-BSS) are also of considerable interest beyond the EU, as other countries are also concerned with radon control even if not committed to the EU-BSS.

Radon protection for European citizens

The objective of the new EU-BSS is to provide a sound and fair basis of radon protection for European citizens. Meeting this objective requires that all links in the radon protection “supply chain” – some of which are explicitly mentioned in the EU-BSS article on Rn action plans (article 103 and annex XVIII) - are quality assured. The chain consists of many conceptually different links, starting from appropriately designed Rn surveys, through metrologically sound measurements, to statistically reliable evaluation and interpretation, to the generation of aggregated objects such as “Rn priority areas” (RPAs), which are those areas that form the basis for certain actions envisaged and required by the EU-BSS. Since RPAs were introduced, their identification has been an important topic in all EU member and candidate states (and beyond, as some non-member states have also decided to adopt the regulation or parts of it).

Quality assurance of all steps in the radon protection chain is necessary, in particular given they are methodically different but have important potential economic and political impact.

Public health and economy

Radon is estimated to cause between 3 % and 14 % of all lung cancer cases depending on the average radon level in the country (WHO, Fact sheet N°291, 2014). For Europe, this corresponds to between 15,000 to 20,000 people per year dying of lung cancer caused by radon exposure. Accurate and reliable radon measurement data are necessary in order to optimise counter measures to reduce the public’s exposure to radon and hence also to reduce the related follow-up costs. The greater the accuracy and reliability of the measurement data, the lower the risk that unnecessary or excessive counter measures will be implemented, with low radiological but high financial impact.

Moreover, member states need to define approaches, data and criteria to be used for establishment of RPAs, for the cost-efficient delineation of areas with potentially high exposure to radon (EU-BSS, Article 103). Harmonisation of radon data at a European level is therefore of crucial importance for European member states as well as the development of methodologies for the identification of areas with potentially high exposure to radon. This is essential for an exchange of knowledge and comparable information on radon levels on a European level and to reduce economic barriers across Europe allowing instrumentation manufacturers to provide their instruments to a harmonised market.

Calibrations and traceability of radon measurements

Effective implementation of the EU-BSS will require accurate and reliable measurement of low radon activity concentrations. According to the BIPM key comparison database of calibration and measurement capabilities, there are currently only a few European facilities that offer radon activity calibrations, and all of them relate to very high radon activity concentrations (of the order of MBq/m^3), which are not relevant in the context of the EU-BSS. The established metrological procedure (primary standard) is to use a decaying radon gas standard in a defined volume for calibrations of radon activity concentrations above 1 kBq/m^3. Using this method for low activity concentration calibration is not practical, as it is time consuming and expensive due to the need for a radon gas standard for each calibration and specific very leak-tight chambers.

Thoron

The influence of thoron (^{220}Rn) on the radon (^{222}Rn) activity concentration measurements has already been observed with some radon monitors. This influence, if not properly corrected, can introduce bias in the radon risk estimates or can generate false alarms if these detectors are used to identify dwellings with radon concentrations that exceed reference/action levels. Detailed knowledge of the influence of thoron on radon measurements is however limited and techniques to correct for or to reduce its influence do not currently exist.

Radon priority areas

National or regional approaches chosen to identify areas with observed or suspected high probability of radon concentrations in buildings above the reference level (Art. 103, EU-BSS) can vary. One strategy relies on directly measured indoor radon data, others on indirect concepts based on the geogenic radon potential (e.g. based on soil radon exhalation rates). There are also different methods used to define the geogenic radon potential of an area. In order to ensure that radon data and decisions on the identification of RPAs are comparable regardless of the approach used, these methods need to be compared and standardised in order to provide comparable results with moderate uncertainties.

Harmonisation of radon measurement approaches and data

Measurements of radon concentrations have been conducted in Europe for years and while they have been subject to quality assurance by comparison exercises in the past (at least for relatively high radon activity concentrations), research needs be undertaken in order to harmonise the different radon measurement techniques (objective 3) and calibrations (objective 1 and 5). These will apply in particular for solid-state nuclear track detectors that are the most common devices used for measurement in dwellings. This issue has been discussed on numerous occasions at conferences and in articles (recently, at the International Workshop of the European Atlas of Natural Radiation, Verbania, Italy, Nov. 2015), which proves the urgency for this topic. The current state of the art is that strong heterogeneities of radon data still exist in Europe.

The European Commission Joint Research Centre in Ispra, Italy, is responsible for the creation of European radon maps (as part of the European Atlas of Natural Radiation). The data harmonisation, aimed at by this project, will provide the possibility to combine radon measurements at a European level and to develop a consistent European radon map.

Example 2: Section B1.d: Need for the project (Research Potential project)

With the development of weighing technology, the number of Automatic Weighing Instruments (AWIs), which carry out measurements in a dynamic mode, has increased. Notwithstanding a generally higher purchase price than for Non-automatic Weighing Instruments (NAWIs), AWIs are more effective and efficient for their users in the long term and improvements in the accuracy of AWIs mean that they are now used in an increasing number of applications. For example automatic catchweighers and automatic gravimetric filling instruments are used extensively in the preparation, production and quality assurance of pre-packed products and other products, where their content or composition is determined by weighing. Based on data from the PRODCOM database, the total annual market size is estimated to be around 15 000 automatic catchweighers and 14 000 automatic gravimetric filling instruments, and these two groups together represent almost 80 % of AWIs sold annually in Europe.

In addition, automatic instruments for weighing road vehicles whilst they are in motion are increasingly used for the time efficient weighing of trucks for trade, supervision, transport safety and law enforcement purposes in a number of European countries including Poland, Czech Republic, Slovenia, Austria, France, the United Kingdom, Portugal and Hungary.

Traceable measurements are enabled by calibration against higher order reference standards that are themselves traceable to the SI. Calibrations also require a robust and reliable estimate of the uncertainties associated with the measurements. While NAWIs are routinely calibrated by accredited calibration laboratories (based on the Guidelines on the Calibration of Non-Automatic Weighing Instruments EURAMET/cg-18), the calibration of AWIs is not as well defined. In addition, due to the variety of AWIs and their operation in the dynamic mode, there is no standard approach for their calibration. In Spain, for example, there were no legal requirements for AWIs before the Measuring Instruments Directive (MID) “2004/22/EC of the European Parliament and of the Council of 31 March 2004 on measuring instruments” came into force.

There is also an increasing need for the metrological quality of AWIs to be confirmed by calibration in order to meet the requirements of ISO 9001 or specific laws that apply for regulated industries as pharma or food (Good Manufacturing Practice – GMP and Food Safety Standards – IFS, BRC, SQF). The producers of the pre-packed products according to directive “76/211/EEC of 20 January 1976 on the approximation of the laws of the Member States relating to the making-up by weight or by volume of certain pre-packaged products, require a reliable estimation of the measurement uncertainty in order to better evaluate and optimise the production process. Therefore, users of AWIs need information on their measurement uncertainty and repeatability (in the dynamic mode) to enable informed decisions to be made. Appropriate measurement methods for the calibration of selected categories of AWIs and error models for the dynamic weighing process therefore need to be developed and validated.

The concept of the measurement uncertainty has also been introduced in legal metrology. At the world-wide level, the Organization Internationale de Métrologie Légale (OIML) Technical Subcommittee TC3/SC5 (Metrological Control/Conformity Assessment) is drafting a new OIML Document on the role of measurement uncertainty in conformity assessment decisions in legal metrology. The main aim of this OIML Document is to provide guidance on incorporating text into OIML publications that describes when and how to take measurement uncertainty into account when using measured values obtained during the testing or verification of a measuring instrument, as the basis for making pass-fail decisions in legal metrology. This OIML Document will influence all OIML Recommendations, including Recommendations for AWIs. Therefore, knowledge and information on the estimation of measurement uncertainty, including for example uncertainty budgets for the calibration of AWIs and for the determination of the uncertainty of a weighing result, are needed in order to support further OIML activities in this field.

Further to this, in order to ensure a consistent approach and reliable and comparable measurements for AWIs operating in the dynamic mode, calibration laboratories, conformity assessment bodies (notified bodies and other nationally designate conformity assessment authorities), accreditation bodies and producers of AWIs require guidance on calibration methods and uncertainty evaluation.

The inclusion of emerging EURAMET member countries in the research and development of methods for calibration of automatic weighing instruments operating in a dynamic mode is necessary to bridge an existing gap between countries with different levels of services in respect of traceability of weighing instruments. In particular countries with an association agreement with the EU need to develop their scientific and conformity assessment competence, to support the implementation of the MID (measurement uncertainty is important in the conformity assessment decision process).

Finally, it is important to avoid the scenario where NMIs or other organisations individually develop national solutions for standardised calibration methods for weighing instruments operating in a dynamic mode. Instead, calibration procedures and uncertainty evaluation need to be harmonised at a European level in order to support a common market. This can be achieved by a consortium that includes

a number of NMIs, which can jointly develop the required guidance, whilst interacting with and taking into account the needs of stakeholders. It is also important to ensure a coordinated and sustainable approach to development of measurement capabilities of less developed or experienced NMS/DIs, and hence the development of individual strategies the relevant NMI/DIs for the long-term operation of the capacity developed, including regulatory support, research collaborations, quality schemes and accreditation, and for offering calibration services from the established facilities to their own country and neighbouring countries would be beneficial.

4.5.5 Section B1.e: Progress beyond the state of the art

This section must describe the current state of the art in the technical area(s) of the project's research. This section should be approximately 1.5-2 pages in length and should state the best uncertainties and/or range that can currently be achieved and whether parameters can be measured or if the measurement is possible but is inefficient, inaccurate, unreliable or time-consuming.

It is recommended that you structure this section into subsections for each of the scientific and technical objectives of the project and then describe the current state of the art and progress beyond for each of them. The current state of the art and progress resulting from the project should be clearly differentiated.

You should state why progress is required to meet the needs described in Section B1.d, and how your project progresses beyond the state-of-the-art in numerical terms, including target uncertainties or ranges. If your project directly continues and develops the work undertaken in a previous JRP please summarise the conclusions from that JRP and indicate how your project progresses beyond that project. In addition if there are other closely linked JRPs please indicate how your proposal progresses beyond those projects.

Please note, that in Research Potential projects the state of the art may be equivalent to the current capabilities within a group of countries rather than the best available across Europe as a whole and due to the different needs between countries or regions, the progress may not be beyond the best capabilities available in some other countries. Please note that proposals should not include lists of the equipment currently available. For Pre- and Co-Normative projects the progress beyond the state of the art relates to the establishment of data, methods and techniques that are suitable for implementation and regular use as part of the standardisation process or to underpin the development of new documentary standards.

Example 1: B1.e: Progress beyond the state of the art (Environment project)

Traceable calibration of radon (^{222}Rn) measurement instruments at low activity concentrations and radioactive reference sources with stable and known radon emanation rates (Objective 1):

Current state of the art

Under the EU-BSS, EU member states are required to ensure that levels of relevant radon activity concentrations do not exceed 300 Bq/m^3, hence effective implementation of the EU-BSS will require accurate and reliable measurement of low radon activity concentrations. Currently traceable radon measurements are only conducted at activity concentrations >500 Bq/m³. The established metrological procedure (primary standard) is to use a decaying radon gas standard in a defined volume for calibrations of radon activity concentrations above 1 kBq/m^3. Using this method for low activity concentration calibration is not practical, as it is time consuming and expensive due to the need for a radon gas standard for each calibration and specific very leak-tight chambers. Better, more (long-term) stable and reliable sources and methods that are easier to use and could be used at more calibration facilities, need to be developed in order for traceable calibrations and measurements to be performed below this limit with reasonable uncertainties.

Progress beyond the state of the art

The project will develop new radioactive reference sources for ^{220}Rn (radon) and ^{222}Rn (thoron) with stable and known radon emanation rates for the realisation of reference fields for radon activity concentration in air. Novel procedures for the traceable calibration of ^{222}Rn (radon) measuring devices (active and passive monitors) in stable radon atmospheres at low activity concentrations (100 Bq/m^3 to 300 Bq/m^3) with relative uncertainties ≤ 5 % (k=1) will be developed.

Although an intercomparison of calibration for high radon activity concentrations has been conducted in the past, this was more than 10 years ago and hence two new two CCRI(II) comparisons of existing radon gas primary standards at different European NMIs/DIs for ^{222}Rn and ^{220}Rn in the range of a few kBq will be undertaken.

Influence of thoron (^{220}Rn) and its progeny on radon end-user measurements and radon calibrations (Objective 2):

Current state of the art

It has been observed that the presence of thoron and its progeny (^{212}Pb, ^{212}Bi+^{212}Po/^{208}Tl) can have an influence on radon activity concentration measurements. Although several scientific studies on the influence of thoron on radon measurements are available in the literature, this information is in general not harmonised and therefore not usable by end users and decision makers. Detailed knowledge of the influence of thoron on radon measurements is therefore limited and techniques to correct for or to reduce thoron's influence on radon activity concentration measurements do not currently exist.

Progress beyond the state of the art

The sensitivity of radon monitors and detectors to thoron will be evaluated, with traceability to a primary thoron system, and in addition the sensitivity of radon (thoron) monitors and detectors to radon and thoron under mixed radon + thoron atmospheres and under

temperatures in the interval typical for the real environment (e. g. -15 °C to +60 °C) will also be investigated. Conclusions about the dependence of the signal on the specific environmental conditions (radon to thoron ratio, temperature, time variations of radon/thoron concentrations and temperature) will be drawn and the consequences for the design of radon surveys under real conditions (e.g. working places, soil gas etc.) will be considered and analysed. Separately, technical concepts and solutions will be proposed to firstly potentially correct the thoron-related bias to the radon signal in radon monitors and secondly to reduce the thoron-related bias to the radon signal in radon monitors through the use of membranes that act as a barrier to thoron.

Existing radon measurement procedures and approaches to optimise the consistency of indoor radon measurements and soil radon exhalation rate measurements across Europe (Objective 3):

Current state of the art

Radon surveys (both indoors and outdoors) and radon measurements are carried out differently in European countries, dependent on political decisions, the aim of the survey, availability of resources and infrastructure, and these different methodologies and procedures may lead to inconsistencies, i.e. different values of the nominally same quantity. Intercomparisons on surface soil radon exhalation rates and radon concentrations in soil gas are rare and there are few laboratories whose results have been tested under in-situ conditions, and hence comparability of data cannot be not guaranteed.

Progress beyond the state of the art

Existing indoor and geogenic radon survey data will be analysed and evaluated in order (i) to identify the rationale and methodologies used, (ii) to identify the extent and possible sources of inconsistencies in the results of indoor radon surveys and (iii) to propose approaches to reduce inconsistencies and improve harmonisation of indoor and geogenic radon data. The project will carry out inter-comparisons of the magnitudes of surface soil radon exhalation rate and radon concentrations in soil gas, thus improving knowledge of the relationship between the two and also increasing the number of laboratories whose results have been tested under in-situ conditions. By comparing existing radon measurement procedures in different European countries, the results will be used to optimise the consistency of indoor radon measurements and soil radon exhalation rate measurements across Europe. Information about indoor radon and geogenic radon surveys in Europe regarding strategy, methodologies and their potential for use as a basis for implementation for the EU BSS will be provided to the relevant stakeholders, including results of the on-site inter-comparison exercise. Methodologies to harmonise indoor data (i.e. seasonal correction, short-term and long-term measurements) will be published.

Methodologies for the identification of radon priority areas, the development of the concept of a Radon Hazard Index (RHI), and the relationship between soil radon exhalation rates and indoor radon concentrations (Objective 4):

Current state of the art

As the definition of radon protection areas (RPA) in the EU BSS allows a wide range of interpretation, different concepts and methodologies have been proposed and some already adopted. Currently there are many approaches ways used to define geogenic Rn risk areas which usually form the basis for the definition of RPAs, and this leads to most data being incomparable as the models and concepts used are vastly different.

Progress beyond the state of the art

This project will analyse and develop methodologies for the identification of radon priority areas (RPA), to investigate the relationships between indoor Rn concentration and quantities related to geogenic Rn, including soil exhalation. The use of compact discs (CDs) and DVDs for retrospective radon measurements and their potential to define radon priority areas will be evaluated. These methods employ CDs or DVDs that are available in almost all public and private buildings in Europe as “detectors” and allow the average radon concentration to be assessed in retrospect, as well as systematic changes due to constructive (including energy-efficiency) interventions. New techniques for measurement of radon exhalation from soil, based on liquid scintillation counting of polymers or track-etching of CDs, will be developed and evaluated. The aim is to analyse and develop methodologies for the identification of radon priority areas (i.e. areas with high radon concentrations in soil, as defined in the EU BSS), including the development of the concept of a Radon Hazard Index (RHI), and to investigate the relationship between soil radon exhalation rates and indoor radon concentrations. Definitions of radon priority areas (RPA) optimised to the radon action plan and their estimation optimised to the availability of the input data will be established, including strategies to deal with RPAs which have been defined inconsistently across borders. Finally, a methodology for a harmonised “radon hazard index” (RHI) will be proposed which could be used as a tool to help identify radon priority areas.

Validation of the traceability of European radon calibration facilities, and guidelines and recommendations on calibration and measurement procedures for the determination of radon concentration in air (Objective 5):

Current state of the art

The desire to improve and harmonise radon measurements in air has increased over the last decade or so, as radon activity concentrations in air measured with different radon monitors were found to be inconsistent with each other when the monitors are were placed in the same environment. At present, secondary radon standards are calibrated at relatively high activity concentrations, however calibrations and measurements at low activity concentrations with sufficiently low uncertainties, as required in the context of the EU-BSS, are not available. The traceability and reliability of measurements at low radon activity concentrations by existing European radon calibration facilities e.g. NMIs/DIs, accredited laboratories, other calibration laboratories and universities is therefore unclear.

Progress beyond the state of the art

A validation of the traceability of existing European radon calibration facilities will be undertaken both by comparisons of the calibrations of radon measuring instruments in the range from 300 Bq/m^3 to 10 000 Bq/m^3 and by comparison of the secondary standards used by European radon calibration facilities in the range from 100 Bq/m^3 to 300 Bq/m^3 to the reference device calibrated in a reference radon atmosphere traceable to a primary standard. Such calibrations in stable radon atmospheres will enable sufficiently low uncertainties to be achieved for low radon activity concentration measurements. Information about the validation of traceability of European calibration facilities for radon concentration measurement in air will be provided to all relevant stakeholders and guidelines and recommendations on calibration and measurement procedures for the determination of radon concentration in air will be published.

Progress beyond ENV57 MetroERM and IND57 MetroNORM

Within ENV57 MetroERM the focus was on environmental monitoring of man-made radionuclides (e.g. ^{137}Cs, $^{239/240}Pu$, etc.). Only the influence of radon and its progeny on these monitoring measurements was considered, not the measurement of radon itself (e.g. the influence of radon progeny concentrations on dose rate detectors (Task 1.6 MetroERM)). In the scope of IND57 MetroNORM only very specific questions regarding radon exposure of workers in waterworks and the emanation of radon from building materials were addressed (Task 3.3 MetroNORM). In this project the focus lies on the measurement of radon itself and all relevant exposure situations are considered (exposure due to radon in dwellings and workplaces).

Example 2: B1.e: Progress beyond the state of the art (Research Potential project)

Calibration methods

Current state of the art

Automatic catchweighers and automatic gravimetric filling instruments are by far the two most numerous groups of automatic weighing instruments (AWIs). Together they represent almost 80 % of AWIs sold annually in Europe, and are widely used in many industries, in particular in the food industry. In addition the number of automatic instruments for weighing road vehicles in motion, which are mostly used for weighing trucks for trade and law enforcement purposes, has increased significantly during the last decade in several European countries. This type of weighing instrument has also undergone the highest rate of improvement in accuracy compared to other groups of weighing instruments.

Other groups of AWIs such as continuous totalising automatic weighing instruments (belt weighers), discontinuous totalising automatic weighing instruments (totalising hopper weighers) and automatic rail weighbridges are not as widely used. Their testing is logistically very demanding and goes beyond the capabilities of this project. Discontinuous totalising automatic weighing instruments can also reasonably be calibrated as static instruments.

The EURAMET guideline cg-18 is a well-established guide which is commonly used by calibration laboratories. It is recognised by accreditation bodies in Europe and also in other regions as a standard method for calibration of non-automatic weighing instruments (NAWI). However, the guide does not address AWIs, especially not those instruments that operate in the dynamic mode and there is no existing harmonised and standardised method for evaluation of the measurement uncertainty of the calibration of AWIs. Traceability of AWIs is also not currently ensured by accredited calibration based on harmonised calibration procedures.

At present automatic weighing systems are often only calibrated in a static way, rather than dynamically as they are used in practice. In practice the approximation is generally made that the measurement uncertainty of the AWI's calibration in the dynamic mode equals the uncertainties determined for the static calibration only. This is misleading for all parties concerned, since dynamic operation can introduce additional sources of errors and influences that may not be apparent when an instrument is calibrated statically. The same applies to determining the weighing instrument's performance at varying speeds of the operation of automatic instruments as there are currently only limited reliable and traceable data for the connection between speed and weighing performance. Therefore, producers and users of weighing instruments find that the methods for validation and calibration of automatic weighing applications are vague and can be interpreted in a variety of ways.

In the field of legal metrology there are a number of OIML Recommendations (OIML R50, R51, R61, R106, R107, R134), which cover requirements and conformity assessment procedures for AWIs. These OIML Documents (with the exception of OIML R134) also serve as normative documents referenced in the MID. Currently, the OIML Recommendations for AWIs only define the maximum uncertainty level of the reference standards. In conformity assessment the measurement uncertainty information is crucial for the conformity decision, and the importance of the measurement uncertainty in the conformity decision process has been recognised by OIML. Consequently, a new OIML document on 'The role of measurement uncertainty in conformity assessment decisions in legal metrology' is in preparation.

Beyond the state of the art

In order to maximise the impact from the available project resources, three categories of AWIs representing the most commonly used instruments were selected and will be addressed in the project, i.e. automatic catchweighers, automatic instruments for weighing road vehicles in motion and automatic gravimetric filling instruments.

The project will develop and validate appropriate measurement methods for the calibration of the selected AWIs. The results obtained using the new methods for calibration of AWIs operating in the dynamic mode will be compared with the static weighing of objects. The relevant specific content of a calibration certificate for the calibration of an AWI will also be defined and the reproducibility of methods developed will be confirmed by comparison of dynamic weighing measurements between the partners.

The project will develop error models for the dynamic weighing process for these 3 categories of AWIs and will determine the potential sources of measurement uncertainty for these instruments. Uncertainty budgets for the determination of the uncertainty of measurement for the calibration of AWIs and for the determination of the uncertainty of a weighing result will be developed and will be validated by comparisons and cross-checked with static methods.

Calibration guides based on the methods developed in the project will be prepared for the 3 selected categories of AWIs; automatic catchweighers, automatic instruments for weighing road vehicles in motion and automatic gravimetric filling instruments and in this way the highest metrological and economic benefits are expected for end-users. EURAMET calibration guides are prepared and published by EURAMET technical committees, therefore the draft calibration guides will be submitted to EURAMET Technical Committee for Mass and related Quantities (EURAMET TC-M) for further approval by EURAMET. The harmonised calibration guidance will also serve as input on the measurement uncertainty evaluation for international organisations such as OIML and the European Cooperation in Legal Metrology (WELMEC), which deal with the conformity decision process for AWIs for legal metrology purposes.

The research in this project is not aimed at improving the dynamic properties of AWIs, which would result in improved characteristics of AWIs and lower measurement uncertainties. The uncertainties and the measurement range will depend on the calibrated AWI itself. In addition, the project does not aim to define specific measuring ranges and measurement uncertainties, which the guidance

documents will address. The guides will instead be targeted to provide more general guidance on the calibration of selected groups of AWIs, irrespective of their measurement range. It is expected, that the dynamic properties and other characteristics of the calibrated instruments will influence the measurement uncertainty the most, and not the reference standards used. However, some indicative estimates of the relative measurement uncertainty of the error of indication may be given, namely 0.005 % - 0.05 % for automatic catchweighers, 0.02 % - 0.1 % for automatic gravimetric filling instruments and 0.2 % - 2 % for automatic instruments for weighing road vehicles in motion.

Research potential

Current state of the art

Several EURAMET members and representatives of industry take part in regular modifications and the updating of Guidelines on the Calibration of Non-Automatic Weighing Instruments EURAMET/cg-18. This approach demonstrates significant impact and knowledge transfer of EURAMET activities in this field to national accreditation bodies responsible for accreditation of calibration laboratories for NWAIs. Users of NWAIs profit from EURAMET research activities through having their instruments calibrated by well elaborated and widely recognised calibration methods.

To date there have been no coordinated activities between NMIs in the field of traceability of AWIs operating in the dynamic mode, since the NMIs currently primarily focus on traceability and research in the field of mass standards with a smaller part of these activities being related to NAWI calibration methods. In addition the weighing instruments legal metrology community has not so far launched activities on evaluation of measurement uncertainty related to the automatic instruments and dynamic measurements.

Several emerging EURAMET countries are in the process of transposing the MID into national legislation and they need to increase their expertise and research potential in the field of AWI. Their first aim is related to conformity assessment of these groups of weighing instruments, but there is also a need to develop expertise in this field for the purpose of establishing proper traceability to meet the needs of industry, particularly related to the production and supervision of the mass of pre-packaged products.

Beyond the state of the art

The project will extend the scope of research capabilities of NMIs to the field of dynamic mass measurements by AWIs. The partners with significant expertise in the field of calibration of AWIs or NAWIs are also authorised by their legislation or governments for the conformity assessment of AWIs, which forms the fundamental basis for their research excellence in the field of calibration of dynamically operated automatic weighing instruments.

Collaboration between EURAMET NMIs/DIs that are less experienced in the field of testing or calibration of AWIs with NMIs/DIs with greater experience will develop their metrology research capabilities and in particular their metrological infrastructure for traceable dynamic mass measurements. The partners from emerging EURAMET countries will also be trained, and will cooperate and independently carry out tasks in the project. These capacity building activities will consequently enable development of the calibration infrastructure on lower levels in their countries and will also support proper implementation of the MID and Pre-packages Directives, which are important for free movement of goods within the EU internal market.

In addition, the partners will develop individual strategies for the long-term development of their research capability in dynamic mass metrology including priorities for collaborations with the research community in their country and the establishment of appropriate quality schemes and accreditation (including participation in key comparisons and submission of CMCs to the KCDB). The partners will also develop a strategy for offering calibration services from established facilities to their own country and neighbouring countries. The individual strategies will be discussed within the consortium and with other EURAMET NMIs/DIs, to ensure that a coordinated and optimised approach to the development of traceability in this field is developed for Europe as a whole.

Achieving the project objectives will lead to an improvement in European metrological capability and infrastructure beyond the lifetime of the project. Harmonised and validated reproducible calibration methods and uncertainty evaluation models for AWIs in the form of a EURAMET guide will be available to producers, calibration laboratories and accreditation bodies after conclusion of the project and consequently end-users of AWIs will benefit from traceably calibrated of AWIs operating in the dynamic mode. Finally high level expertise and research capabilities in this field will become available in a number of European NMIs, which will facilitate the transfer of project outputs to stakeholders.

4.6 Section B2: Potential outputs and impact from the project results

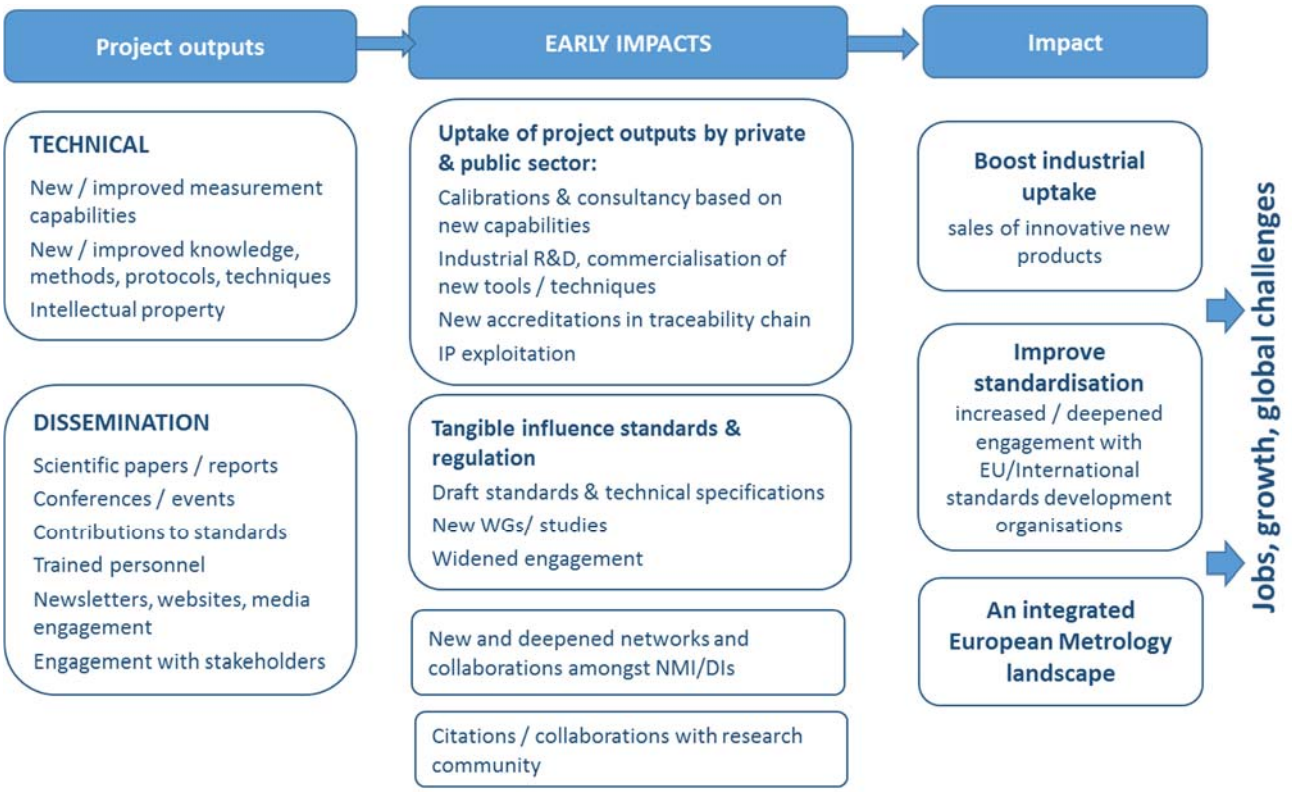
This section is made up of four sub-sections. In Sections B2.a, B2.b and B2.c you should provide details of the **early impacts** (see definition below) in three areas (i) user uptake and use of project outputs amongst industrial and other user communities and (ii) uptake and use by the wider metrological and scientific communities and (iii) improved standards and uptake by the standardisation community, (respectively). Then in Section B2.d describe the **wider economic and social impacts** that your project will contribute to and the routes to facilitate them.

You should describe how your project will make a positive difference to Europe (and internationally) by addressing the needs described in Section B1.d. This should not be a statement of what your project will do (i.e. you do not need in-depth technical details), but a statement of the benefits the project will bring to those who make direct use of the new measurement capabilities (**early impact**) (such as reduced uncertainties, extended measurement ranges, new reference standards, new or improved methods, devices, new knowledge, etc.) and how these early impacts will contribute to the wider economic and societal benefits (**wider impacts**). You should also ensure that the impact you describe can realistically be achieved by your project.

You should clearly explain what the impacts will be and the route to impact. You should clearly explain:

- What the new measurement capabilities will be at the end of the project (**project outputs**) and how these will lead to benefits for the direct users of the new measurement capabilities, and who these direct users will be (**early impact**) (Sections B2.a, B2.b and B2.c)
- How the **early impacts** will lead to wider economic and social benefits (**route to wider impact**) such as such as, improving industrial productivity, mitigating climate change, supporting the implementation EC Directive (Section B2.d)

The early impacts and benefits you describe should be specifically attributable to the outputs and aims of the project.



4.6.1 Section B2.a: Projected early impact on industrial and other user communities

This section is mandatory. It may be less directly relevant for Fundamental projects, but is still required.

The section should be a maximum of 1 page and should describe the direct effect your project will have on the users of the new measurement capabilities e.g. in industry and in the public sector. The early impacts described in this section should relate to the uptake, exploitation and use of project outputs (new measurement capabilities such reduced uncertainties, extended measurement ranges, new reference standards, methods, devices, new knowledge, etc.) by the early users of the project's outputs. These impacts will begin in the short-term, (towards the end of the project and very soon after its completion). The beneficiaries are expected to be the people and organisations in the target user community, with which the project has had direct interactions, such as the project's non-NMI/DI partners, collaborators and stakeholders, advisory board members etc. (particularly those in industrial and other user communities such as organisations that deliver public services such as hospitals, environmental monitoring).

You should describe your expected early impacts including: details of who the organisations are (specific organisations and types of organisations) that will benefit from the new measurement capabilities; which project outputs different types of beneficiaries will benefit from, as well as describing how you will ensure the maximum benefits are achieved. Please ensure that the impact you describe in this section is consistent with the activities in your "Creating impact" work package (see Section CN-1) – however this section should not simply be a description of dissemination activities.

Example 1: Section B2.a: Projected early impact on industrial and other users (Industry project)

The project will develop a range of new pressure-related measurement capabilities at NMIs of direct relevance to industrial communities.

The project will establish a new primary standard and support dissemination of the pressure scale in the intermediate pressure range 1 Pa to 10^4 Pa. This will improve the reliability and accuracy of low gauge, differential and absolute pressure measurements at many levels from NMIs, to accredited commercial laboratories, to the end users. This traceability is the basis for more accurate pressure measurement (e.g. for the cleanroom technologies and processes) and will enable realisation of tighter tolerances of non-equilibrium conditions and, as a consequence, reduce energy consumption and costs without loss of safety, sterility and precision. The project's results should also support the use of more neighbouring zones with individual pressure conditions which will offer new ways for process optimisation. The costs of operations involving toxic and nuclear materials as well as of the storage of environmentally dangerous toxic and nuclear wastes should also be reduced and the safety of these processes increased.

In addition, the project will establish an EU based calibration service that is expected to be competitive to that available in the USA. The calibration service will provide end-users with access to calibrations in the range 0 Pa to 15 kPa absolute pressure with uncertainties at the level of $3 \cdot 10^{-5} \times p$ + 5 mPa. This will be realised with state-of-the-art pressure measurement instrumentation such as force-controlled piston gauges with a resolution of 1 mPa. Such conditions will be beneficial for more efficient and safe use of airspace by aircraft, for example through more reliable monitoring of aircraft vertical separation.

Dissemination of traceability from NMIs in the intermediate pressure range will provide access to improved capabilities for national and accredited laboratories in Europe and support consistency in measurement capabilities. Additionally, it will benefit the industrial companies that rely on such calibration services. Information on the calibration services will be disseminated via accredited bodies (for pressure) in Europe, calibration laboratories or, in Germany, via the Deutsche Kalibrierdienst (DKD)/committee of experts for pressure. Transportable medium vacuum range calibration equipment will also be created to provide a calibration service at an end user site.

To facilitate up take of the project's outputs there will be considerable engagement throughout the project with industrial stakeholders including manufacturers of pressure measuring devices as well as end users and calibration laboratories. The participation of industrial partners in the project and the establishment of a Stakeholder Community will also ensure that the project is aligned with industrial needs. In addition at least one international workshop as well as seminars at the national level will be held to share project outputs and engage with the target user communities. Uptake of the new measurement capabilities developed in the project by partners and key stakeholders is expected during and shortly after the project. Early uptake will be among the accredited laboratories and the manufacturers of pressure measuring sensors instrumentation and equipment that relies on pressure measurements such as clean room equipment, process equipment for the energy sector and avionics instrumentation; enabling them to confidently demonstrate the performance of their products and ensuring they remain internationally competitive.

Finally, the project will create preconditions for the replacement of mercury-containing pressure-measuring instruments with mercury-free alternatives. The results will be provided to policy makers and stakeholders in European industry including the CCM Pressure Working Group, IMEKO TC 16, the project Stakeholder Committee and pressure subcommittees of the RMOs, weather monitoring and forecast services and airlines.

4.6.2 Section B2.b: Projected early impact on the metrological and scientific communities

This section is mandatory. It should be a maximum of half a page in length and should describe the direct impact your project will have on the metrological and scientific communities.

In the metrological community, early impacts will include contributions to advances in the SI system, important inputs to high-level metrology committees such as the Consultative Committees, and/or changes (or proposed changes) to NMI/DI Calibration and Measurement Capabilities (CMCs) statements recorded in the BIPM Key Comparison Database (KCDB). In the scientific community, early impacts will include significant or widespread use of the project's outputs by the scientific research community, as indicated, for example, by highly cited publications or further significant collaborations with the scientific community. Please ensure that the impact you describe in this section is consistent with the activities in your "Creating impact" work package (see Section CN-1).

Example 1: Section B2.b: Projected early impact on the metrological and scientific communities (Industry project)

Based on the project results, a recommended *mise en pratique* for assuring traceability in the range 1 Pa - 15 kPa using force-balanced piston gauges in both absolute and gauge mode will be derived. This will significantly impact on calibration laboratories, as intervals and intermediate checks differ widely between laboratories and the evaluation of uncertainties during assessment requires a common understanding and general principle for assuring traceability. The recommendation is to be presented to the accreditation authorities in Europe as well as to end users and manufacturers of force-balanced piston gauges.

In the area of the force-balanced piston gauges (FPGs), knowledge transfer from experienced NMIs to those less experienced in how to use this new type of instrument will be very beneficial. It will help to raise their knowledge and measurement capabilities and will promote consistency within pressure metrology. On a broader scope, the project will strengthen the collaboration of European NMIs and will increase their competitiveness with NMIs outside Europe. Secondary accredited commercial laboratories will also gain a better calibration service from the European NMIs which will avoid high costs and associated downtime associated with the calibration of their standards abroad and will increase their calibration capabilities. In particular, uncertainties and calibration techniques when using FPGs will be investigated and recommendations for ensuring the traceability of measurements with FPGs in the range 1 Pa - 15 kPa will be produced. A draft calibration guide for using FPGs in both absolute and gauge mode will be produced and submitted to EURAMET for publishing as a EURAMET calibration guide.

Improved calibration methods for positive and negative gauge pressure standards in the range from approximately -100 kPa to 15 kPa will be developed. A EURAMET calibration guide for positive and negative gauge pressure standards will be drafted that will describe different calibration systems, conditions under which they are to be operated, procedures to be followed, uncertainties aimed at and the best working practices. The draft guide will be submitted to EURAMET and made available to end users.

Research papers will also be submitted for publication in high impact peer-reviewed journals and as part of the knowledge transfer a workshop on intermediate pressure measurement will be organised and held, to which representatives of industry (both manufacturers and users), academic and NMIs will be invited.

4.6.3 Section B2.c: Projected early impact on relevant standards

This section is mandatory. It may be less directly relevant for Fundamental projects, but is still required.

The section should be a maximum of 0.5 page (excluding the table) and should describe the early impact your project will have on relevant documentary standards. These standards should be at a European or International level and may be standards developed and published by formal standards developing organisations (such as ISO, CEN, OIML etc.) or important well-recognised industry standards (such as those developed by IEEE, etc.). If a standard has been mandated by the European Commission (usually in support of an EC Directive) or is a critical need specified by an industry body this should be noted (and references provided).

Early impact should be described in terms of expected tangible contributions to specific new or improved standards (or draft standards) that the project will contribute to. You should identify the most important documentary standards and the organisations/standards bodies/committees that will provide the **most likely route to delivering impact** and which will be the focus of the project's research and dissemination activities regarding standards. It is also important to consider which standards are in need of updating or improvements and are due to be updated in the next 2 to 4 years (i.e. where the project can deliver impact).

You should indicate;

- Whether your consortium has existing links with the organisations/standards bodies/committees
- Whether your consortium plans to build new links to organisations/standards bodies/committees
- Which partners are involved and what they plan to do

Please ensure that the impact you describe in this section is consistent with the activities in your "Creating impact" work package (see Section CN-1).

Example 1: Section B2.c: Projected early impact on relevant standards (Industry project)

The project will have an impact on the Commission Regulation (EU) No 847/2012 of 19.9.2012 which restricts the use of mercury in barometers and sphygmomanometers for industrial and professional use. The project will have a significant positive impact on the execution of the Regulation by providing equivalent alternative pressure standards. It will also support the reduction in the number of mercury-containing pressure-measuring devices in Europe without any associated disadvantages for industries currently using mercury manometers.

In addition, the consortium will promote the results of the project within the standardisation community and will provide input into the standardisation process (ISO, CEN, and EA). For ISO, the standards relevant to the project that are in preparation/revision will be identified, and the work on these standards will be suggested to the appropriate working groups or committees. However, this process can be very lengthy and will extend beyond the duration of this project.

The partners who are members of corresponding technical committees will inform them about the results of this project and will endeavour to ensure they are incorporated in any updates to the standards or guidelines (see table below). For example, the representatives on the corresponding committee or working group from the project partners will jointly ask the chairperson to include a point in the agenda to briefly present the outputs of the project related to the working group activities and ask for comments to the other committee/working group members. Where appropriate a written report will be submitted for consideration by the committee or working group.

Standards Committee / Technical Committee / WG	Partners involved	Likely area of impact / activities undertaken by partners related to standard/committee
EURAMET TC-M	**BBB**, AAA, CCC, DDD, EEE, FFF, GGG, HHH, III, KKK, LLL	EURAMET TC-M meets annually in February-March. At the next meeting in 2016, the TC-M will be informed about ongoing activities in the project. A draft of a guideline for calibration of force-balanced piston gauges will be presented at TC-M meeting in 2017 and recommendations for negative gauge pressure measurements in 2018.

CCM WG P	**AAA,** BBB, CCC, DDD, EEE, FFF, GGG, HHH, III, KKK, LLL	CCM WG P (Pressure) usually meets every 3 years with the next meeting expected in 2017. CCM WG P will be informed about experience of negative gauge pressure measurements, alternative methods and results of supplementary comparisons. Based on this information, it will be discussed to include negative pressures in the list of key comparisons. Information on potential transfer standards based on CDGs and force-balanced piston gauges gained within the scope of the project will be provided to CCM WG P to be taken into account in the organisation of future key comparisons.
COOMET TC 1.6 "Mass and related quantities"	**BBB**	COOMET TC 1.6 meets annually in September-October. At the next meeting in 2015, the COOMET TC 1.6 will be informed about ongoing activities in the project. Based on the new measurement capabilities developed within the project, it will contribute to the activities of COOMET TC 1.6 on the standardisation of measurement methods for saturated vapour pressure of oils and oil products.
DIN NATG-D Standard Committee Technical Basics - pressure, flow, temperature	**BBB**	BBB has been involved in this committee for several years and will attend committee meetings to disseminate the outputs of the project particularly in relation with the revision of standards DIN EN 13190 and DIN EN 837.
IMEKO TC 16 "Pressure and Vacuum Measurement"	**CCC**, AAA, BBB, DDD, FFF, GGG, HHH, III	IMEKO TC 16 meets every 2 to 3 years in connection with TC conferences and IMEKO World Congresses. CCC is the Scientific Secretary of the IMEKO TC 16. Most project partners are members of TC 16 and will take part in the TC 16 meeting and the next IMEKO World Congress to be held in Prague in September 2015 and disseminate information about the ongoing project.

4.6.4 Section B2.d: Projected wider impact of the project

This section should help the referees understand why your project is important and should be a maximum of 1.5 pages. You should describe the wider (i.e. longer-term) impacts that your project will contribute to and the routes to facilitate them (i.e. the links between the early impacts and the wider impacts).

For the wider impacts, please explain the **economic, social and environmental** impact that your project will make across Europe (and internationally). Where possible quantify each of the impacts numerically. You should also provide details of who will benefit from the project, and which aspects of the project each stakeholder group will benefit from.

If your project is expected to contribute to wider impact through EC Directives, regulations and/or legislation, you should provide details of this. Finally, describe how you will ensure that the maximum benefits and impact is achieved by your project.

Example 1: Section B2.d: Projected wider impact of the project (Industry project)

Economic impact:

By improving the pressure scale at the NMI level for low gauge, absolute and differential pressures this project will provide a better measurement capability. In combination with new calibration methods, a more adequate dissemination of the unit “pressure” will also be obtained. Further to this, European calibration laboratories and industry should be able to engage with the new calibration services and to have their instruments calibrated within Europe without the need to send their devices to the US. This will meet the demand of industry to obtain high accuracy calibration services in Europe, whilst making calibrations less time consuming and expensive.

The following industries will benefit directly from smaller uncertainties for low gauge, absolute and differential pressure measurement:

- The clean room condition is directly affected by smaller uncertainties of pressure measurement. To establish clean room conditions in e.g. pharmaceutical, semiconductor or nanotechnology industries different zones are separated by different local ambient pressure levels which prevent contaminated air entering a critical zone. With smaller uncertainties in pressure measurements, smaller pressure differences between these zones are possible which enables the use of more zones at a time but with the same resources in terms of energy and costs. This will make new more efficient, complex and energy saving clean room productions possible.
- In power plants, smaller uncertainties for low gauge, absolute and differential pressure measurement are relevant for safety, efficiency and costs. Such safety systems help to identify environmentally harmful or toxic leakage and prevent pipes or vessels from bursting. In this way they also protect the infrastructure and the environment. Therefore efficiently controlled processes using measurands that avoid non-optimal operating conditions, will be more efficient, less cost intensive and avoid the production of unwanted by-products.
- Steadily increasing numbers of aircraft within European airspace have made it necessary to reduce the standard vertical separation (RVSM) between aircraft from 600 m to 300 m. Avionic altimeters use absolute pressure measurement for height detection, but only specially certified altimeters and autopilots are allowed to enter the RVSM airspace, and these need to be calibrated traceably to the SI via NMI standards. In the future, an even more intensive usage of the airspace will consequently increase the need for smaller uncertainties of low absolute pressure measurements.

Environmental impact:

The European mercury strategy [amendment of Annex XVII to Regulation (EC) No 1907/2006 by Commission Regulation (EU) No 847/2012 on 19/9/2012] restricts the use of mercury in barometers from 10 April 2014 which is an issue for research institutions and reference laboratories in the avionic industry and weather monitoring and forecast services, which all use mercury barometers. Many European NMIs also realise the pressure scale for low gauge, absolute and differential pressures using mercury based liquid column manometers and these devices usually contain 6 kg to 10 kg of mercury. Therefore, a new primary standard, using alternative manometric liquids such as oil, will fulfil the EU demands and reduce the risk of accidental environmental pollution by mercury.

Social impact:

As mentioned, many industries such as pharma-biotech, semiconductor, micro- and nano-technology, petrochemical, aviation, energy production, weather monitoring and forecast services will benefit from the project's output and this should strengthen the European industrial infrastructure for the development of new services and products (that rely on pressure). As a wider impact, Europe's innovative capacity should be increased, leading to higher employment and wealth for society. Finally, the project will improve collaboration between European NMIs, in particular, between smaller/less experienced NMIs and more experienced NMIs.

4.6.5 Section B2.e: Data management

For EMPIR call 2017 onwards, the Grant Agreement will contain conditions related to open access to research data. Projects that 'opt-in' will be required to prepare a Data Management Plan (DMP) which will describe the data management plans for all of the data sets that will be collected, processed or generated by the project.

Please note that even if projects 'opt-in' to having a DMP they will not be required to open up all of their research data. The DMP applies primarily to the data needed to validate the results presented in scientific publications.

The use of a DMP is obligatory for all projects that do not 'opt-out'. Projects can opt-out on the following grounds:

- Incompatibility with the Horizon 2020 obligation to protect results that are expected to be commercially or industrially exploited
- Incompatibility with the need for confidentiality in connection with security issues
- Incompatibility with rules on protecting personal data
- Incompatibility with the project's main aim
- If the project will not generate / collect any research data, or
- If there are other legitimate reasons not to provide open access to research data

Further information on DMPs is available in the EMPIR Reporting Guidelines Part – 9 Preparing data management plans and in Reporting Template 9 – Data Management Plan.

A proposal will not be evaluated more favourably if the consortium agrees to share its research data, nor will it be penalised if it opts-out.

The consortium's approach to research data management should be detailed in section B2.e for projects that both opt-in and opt-out, and should include the following issues:

- How will data be exploited and/or shared/made accessible for verification and reuse? If data cannot be made available, why?
- What standards (including data security and ethical aspects) will be applied?
- How will data be selected, managed and preserved?

You must state whether your proposal will 'opt-in' or 'opt-out' and explain why. This section should be a maximum of 1 page.

Example 1: Section B2.e: Data management (opt-in)

The project chooses to 'Opt-in' to the open access data requirement.

The consortium has chosen to opt-in as the deliverables and/or outputs from the project include publications in peer reviewed journals. Thus, for these to be disseminated as widely as possible and used by as many stakeholders as possible, the data should be freely accessible. Furthermore, the consortium intends the outputs of the project to be adopted and up taken by as many end users as possible. Therefore as the consortium includes NMIs/DIs who will generate data sets which can be considered traceable to the SI, these data sets should be available to other organisations for use in tests and validation.

The project will make its research data Findable, Accessible, Interoperable and Reusable (FAIR) in order to ensure that it is soundly managed. The consortium will produce a suitable Data Management Plan (DMP) which will describe the data management plans for all of the data sets that will be collected, processed or generated by the project. The DMP will cover the following aspects:

- the handling of research data during and after the end of the project;
- specification of the data that will be collected, processed or generated;
- the methodology and standards (including data security and ethical aspects) that will be applied;
- plans for data curation and preservation (including after the project).

An outline DMP will be created within the first month of the project and agreed by the consortium. The consortium intends prepare a first draft of the DMP for discussion at the project kick-off meeting. Each subsequent project meeting will include an agenda item on the DMP.

The consortium agrees to deposit its open access data sets in suitable repositories. These will be located by the consortium using the Registry of Research Data Repositories (http://www.re3data.org/). Possible examples include Zenodo (https://zenodo.org/), which will allow the consortium to deposit both publications and data, and the EUDAT B2SHARE tool (https://b2share.eudat.eu/) which includes a license wizard for data licence selection.

In order to follow current best practice on data management further information will be obtained by the consortium from the Digital Curation Centre (http://www.dcc.ac.uk/dmponline), ScienceMatters (https://www.sciencematters.io/) and the Research Data Alliance (http://rd-alliance.github.io/metadata-directory/). The project will also seek to follow current best practice guidance on open data such as that from the Open Data Institute (https://theodi.org/).

As a minimum, the consortium will ensure that the data selected for open access:

- can be linked to and is available in a standard, structured format (e.g. JSON, XML, ASCII or TIFF), so that it can be easily shared;
- is consistently availability over time, so that end users can reliably use it;
- is stored self-descriptively or with a link to the publication/document (e.g. identified with a DOI) that accurately describes the data format and parameters used.

The selection of data to be openly accessible will be made on a case by case basis and agreed by the consortium. This will include ethical aspects and data security such as for the protection of IP for any project outputs that are considered to be commercially exploitable. In such cases, it may be necessary to withhold all or some of the data generated. This will be decided by the relevant partner(s) and managed by the DMP, the Consortium Agreement and if appropriate the project's exploitation plan.

Example 2: Section B2.e: Data management (opt-out)

The project chooses to 'Opt-out' to the open access data requirement.

The consortium has chosen to opt-out because of incompatibility with the Horizon 2020 obligation to protect results that are expected to be commercially or industrially exploited.

The consortium believes that the protection of innovative research at an early stage or, more generally, IP protection, is a way the EU can grow and compete with non-EU economies. As the project is of fundamental nature and has the potential to lead to genuine innovation regarding novel theoretical models, experimental solutions and the design and fabrication of artificial materials, all data produced within the project should not be disclosed by default, even if it only relates to the validation of the results presented in the scientific outputs. In fact, the validation data or methods can themselves be very valuable and subject to potential IP protection.

However, all scientific publications generated within the project will be submitted to scientific journals as open access (as per EMPIR/Horizon 2020 requirements). Additionally, if required by a specific journal, or deemed useful for the broader scientific community, data obtained from the experiments or numerical computations can be made available on the publisher's website.

Furthermore, all partners agree on the importance of having a Data Management Plan (DMP), and a DMP will be maintained by the coordinator and updated as required. The consortium will produce a suitable DMP which will describe the data management plans for all of the data sets that will be collected, processed or generated by the project. The DMP will cover the following aspects:

- the handling of research data during and after the end of the project;
- specification of the data that will be collected, processed or generated;
- the methodology and standards (including data security and ethical aspects) that will be applied;
- plans for data curation and preservation (including after the project).

The DMP will be set up at the beginning of the project and agreed by the consortium. The consortium intends prepare a first draft of the DMP for discussion at the project kick-off meeting. Each subsequent project meeting will include an agenda item on the DMP.

4.7 Section B3: The quality and efficiency of the implementation

4.7.1 Section B3.a: Overview of the consortium

This section should be a maximum of 1.5 pages for proposals with 15 partners or less (up to 20 partners a maximum of 2 pages, and up to 25 partners a maximum of 2.5 pages) and should explain how the consortium brings a balance of skills and high quality experience to the project. You should explain how your consortium makes the best use of the available capabilities and if there are any duplicated skills or facilities between your

partners, you must justify this. Similarly if a few partners dominate particular parts of the project this should be explained.

You must explain the contribution of all partners on a partner by partner basis, even if they have a small role in the project. Please do not name individual people or include collaborators.

Example: Section B3.a: Overview of the consortium

The consortium brings together the leading European NMIs and DIs in high-accuracy pressure metrology, and they are complemented by a number of research institutes and companies that bring in their specific knowledge and experience. In total, 9 NMIs/DIs, 3 universities and 1 company are included.

- BBB has expertise operating liquid column micromanometers, mercury manometers and micromanometers, force-balanced piston gauges of Furness Rosenberg Standard (FRS) type, static and continuous expansion systems, state-of-the-art density measurement capability, used e.g. in the Avogadro project, and facilities for dimensional measurements on piston-cylinders, modelling the rarefied gas flow in the piston-cylinder gap, application of optical methods for dynamic vacuum measurements. Further to this BBB has experience in coordinating previous pressure-related EMRP projects (JRP IND99 MEASURE).
- AAA has experience operating force-balanced piston gauges (FPG) of 8601 type, possesses a continuous expansion system covering the pressure range up to 3 Pa, and has expertise in the adjustment of the piston in cylinder by a capacitance measurement method and in weather-independent pressure calibration approaches, calibration and measurement of low pressures using CDGs.
- CCC has facilities in the intermediate pressure-to-vacuum range, such as a primary mercury column, a force-balanced piston gauge, a static and a dynamic expansion systems. These capabilities are important in the characterisation of pressure standards for use as alternatives to mercury manometers.
- DDD can calibrate force-balanced piston gauges against state-of-the-art pressure balances operated in gauge and absolute pressure mode. In particular it has experience in the measurement of negative gauge pressure by different methods and has piloted comparisons of negative gauge pressure measurements. DDD also has experience in standardisation work and thus the development of recommendations and norms for negative gauge pressure calibrations.
- EEE has a background in laser spectroscopy of atoms notably with atomic beams and vapour cells for tests of fundamental physics, measurement of fundamental constants and surface physics related to mass standards. It also supervises work on flow metrology and collaborates in projects related to the measurement of the Boltzmann constant via acoustic thermometry. EEE has capability in the assessment of methods for negative gauge pressure calibration as well as the evaluation of alternative pressure standards.
- FFF has primary standards in the intermediate pressure-to-vacuum range such as pressure balances, non-rotating piston gauges of FPG- and V1600D-type, static and continuous expansion systems, facilities and expertise in liquid density measurements. FFF will contribute to the experimental study of force-balanced piston gauges as secondary standards, development and characterisation of transfer standards for the intermediate pressure range and analysis of oils suitable for liquid column micromanometers.
- GGG has pressure balances, force-balanced piston gauges of FPG and FRS type, a static expansion system as well as a measurement capability of refractometric index of gases using Fabry-Perot techniques which can be used for the investigation of alternative systems for pressure measurement by optical methods in the range 1 Pa to 104 Pa. Having close contacts with related industries, GGG will coordinate engagement with industries that utilise pressures in the intermediate range from 1 Pa to 104 Pa and facilitate the uptake of the technology and measurement infrastructure developed by the project.
- HHH has facilities for measurement of density of oils at variable gas saturation conditions and pressures, as well as for measurement of oil viscosity with the uncertainty levels that meet the requirements of the oil micromanometer to be developed within WP1.
- III has special facilities and experience in measuring kinetics of gas absorption and desorption which are required to study potential manometric oils and to predict their density dependence on gas pressure change and time. III has low absolute and gauge pressure standards which will be used for the characterisation of CDGs in the range from 10 Pa to 100 kPa.
- JJJ has expertise in modelling gas flow in the viscous, transient and molecular regimes based on the Direct Simulation Monte Carlo (DSMC) method and approximations based on the Boltzmann kinetic equation. This knowledge is required for analysis and primary characterisation of the force-balanced piston gauges.
- KKK has experience and instrumentation for vacuum generation and measurement, leak testing and vacuum technology, high vacuum gauges calibration, reference leak calibration and leak testing. The measurement capabilities of KKK are useful for the development and characterisation of transfer pressure standards in the intermediate pressure range to be carried out within WP4.
- LLL possesses a force-balanced piston gauge of FPG type and has their specific dimensional measurement techniques and methodology for the effective area calculation which will be applied to characterise their FPG as a primary pressure standard.
- MMM is a worldwide company providing calibration facilities and service for pressure and vacuum to global leaders in industries such as aerospace, automotive, chemical, electronics, energy, pharmaceutical and telecommunications. MMM's participation in the project is important for producing impact in industries that utilise pressures in the intermediate range from 1 Pa to 10^4 Pa and for facilitating the uptake of the technologies and measurement infrastructure developed by the project.

4.8 Section C: Detailed project plans by work package

This section should describe the technical work planned to meet the scientific and technical objectives described in Section B1.b and to deliver the summary list of deliverables in Section B1.c.

Your proposal must contain:

- A maximum of 5 technical work packages.
- 1 “Creating impact” work package (mandatory).
- 1 “Management and coordination” work package (mandatory).

PLEASE NOTE that each work package should have a clear aim, be suitably challenging, and explain how the research goes beyond the current state-of-the-art. Each work package should also demonstrate that the project is collaborative, and therefore should usually have a good balance of partners. In addition, unless stated, it is expected that the activities within the work packages will be carried out using the equipment available at the project partners and under their supervision.

Please do NOT include any photographs, diagrams or lists of references in Section C. Lists of references should only be included in Sections E and G, as appropriate (see Sections 4.13 and 4.15).

4.8.1 Special case of similar work in proposals

In previous Calls there have been occasions where projects addressing different SRTs require similar work. In such cases, you should treat the work as part of your own project, but you should also identify in the relevant tasks where there is synergy with another proposal. Should both projects be selected for funding the overlapping work in each of the projects will be examined and an appropriate resolution will be reached to avoid double funding. It would therefore simplify grant preparation if you design the work in such a way that the potential duplicate work could be removed with minimal changes.

4.8.2 Section C1: Technical work packages

You should choose a suitable and concise title that describes the work in the work package. Then provide a brief overview of the work package, which is a maximum of half a page and includes;

- The aim of the work package, including target uncertainties and ranges (where appropriate),
- A brief overview of the background for the work package and tasks,
- How the tasks of the work package fit together and the task aims. PLEASE NOTE that the task aims must match those stated in each task.

4.8.3 Section C1.a: Technical tasks

You should choose a suitable and concise task title that describes the work/aim of the task. Then describe the aim of the task including the target uncertainties. This should be a maximum of 2 short paragraphs ONLY.

For each task use the activity table format in Template 4: JRP protocol. Using this table, describe the activities that will be undertaken and the role of each partner in the activity. You should include target uncertainties, the number of samples, parameters and selection criteria etc. Where an activity relies on input from another activity, the text should include reference to that dependency. You should also include the end date of each activity e.g. M15, under the activity number in the first column (these dates replace information that was previously included in the ‘Summary list of all activities’). Activities should be scheduled so that all necessary inputs will be available in time. All partners involved in the activity should mentioned in the activity text and listed in the appropriate column, with the lead partner in bold.

For each deliverable in Section B1.c you need to include an activity for the submission of the completed deliverable to EURAMET.

Finally, if a Linked Third Party is included in your project, they should not be mentioned in the activities. Instead, a sentence similar to “The Linked Third Party NNN will work with partner BBB on this task.” should be included under the activities table.

Example 1: Technical tasks (Industry project)

Task 3.1: Development of methods for accurate, weather-independent calibration of low gauge pressure instruments

Frequently, the calibration uncertainty for gauge pressure measuring instruments is much larger than the accuracy of the instruments themselves and the uncertainty of the reference standard, due to the instability of the atmospheric pressure. Therefore, the aim of this task is to develop methods for the accurate calibration of instruments that measure low gauge pressure in such a way that results are independent of ambient atmospheric conditions and provide a measurement uncertainty in industrial conditions better than $2\ 10^{-4} \times p + 3$ Pa.

Activity number	Activity description	Partners (Lead in bold)
A3.1.1 M11	CCC will carry out tests of reference atmospheric pressure stabilisation when calibrating an existing precision gauge pressure measuring instrument against an existing FPG. A hermetic chamber capable of enclosing both the FPG and the calibrated gauge will be used. The calibration results as well as the pressure fluctuation records will be compared by CCC with those obtained under normal/ambient laboratory conditions.	**CCC**
A3.1.2 M18	BBB will carry out tests with a variable volume chamber that is open to the atmosphere or controlled by a pressure controller and used as a source of ambient reference pressure. BBB will use the variable volume chamber to calibrate an existing precision gauge pressure measuring instrument against an existing FRS piston gauge. The calibration results as well as the pressure fluctuation records will be compared by BBB with those obtained under normal/ambient laboratory conditions.	**BBB**
A3.1.3 M22	III will build sensors and electronics that are hermetically sealed and backfilled with nitrogen, in order to prevent humidity influencing the sensor signals. III will provide the sensors and electronics to CCC, who will test the performance of the new sensors and electronics at variable conditions using their hermetic chamber. CCC will provide the results of the tests to III as a statement of the capability of the sensors and electronics.	**CCC**, III
A3.1.4 M24	Using input from the tests in A3.1.2-A3.1.3, EEE will analyse the influence of environmental conditions and their uncertainty on low gauge pressure instruments. From the results EEE will design appropriate methodology (including a pressure circuit) for calibrating low gauge pressure measuring instruments independently of the environmental conditions and with a measurement uncertainty in industrial conditions better than $2\ 10^{-4} \times p + 3$ Pa. EEE will provide the methods to BBB, CCC and III who will review and agree them.	**EEE**, BBB, CCC, III
A3.1.5 M24	CCC, BBB, EEE and III will review the calibration methods from A3.1.4 and will send them to the coordinator. Once the calibration methods have been agreed by the consortium, the coordinator on behalf of BBB, EEE and III will then submit them to EURAMET as **D3**: '*Calibration methods for accurate, weather-independent calibration of low gauge pressure instruments with an uncertainty in industrial conditions better than* $2\ 10^{-4} \times p + 3$ *Pa'.*	**CCC**, BBB, EEE, III

Example 2: Technical tasks (Research Potential project)

Task 2.2: Inter-laboratory comparison of calibration of AWIs

The aim of this task is to organise and perform the first set of international inter-laboratory comparisons in the field of AWIs. The results from the inter-laboratory comparisons will be used to check the reproducibility of the draft calibration methods and uncertainty budgets developed in Tasks 1.1 and 1.2 for the calibration of the 3 selected categories of AWIs automatic catchweighers, automatic instruments for weighing road vehicles in motion and automatic gravimetric filling instruments.

Activity number	Activity description	Partners (Lead in bold)
A2.2.1 M19	CCC and KKK will liaise with the collaborators (most probably XXX, Turkey) and will obtain confirmation from them that their AWI facilities (automatic instruments for weighing road vehicles in motion and automatic gravimetric filling instruments) will be available for the intercomparisons in A2.2.4 and A2.2.5. MMM will provide access to one of their automatic catchweighers for the intercomparison in A2.2.3. CCC, KKK and MMM will determine the requirements for access to each of the facilities. In the event that one or more of the facilities is not available, CCC, KKK and MMM will liaise with the other partners in this task to arrange one or more alternative location for the tests.	**CCC**, KKK, MMM
A2.2.2 M21	Using the inputs from Tasks 1.1 and 1.2 (calibration methods from A1.1.2, A1.1.3 and A1.1.4, and measurement uncertainty budgets from A1.2.2, A1.2.3 and A1.2.4), CCC, BBB, KKK and III will jointly develop a general technical protocol and measurement report template, which will be applicable for the intercomparisons of the calibration of the 3 categories of AWIs: automatic catchweighers, automatic instruments for weighing road vehicles in motion and automatic gravimetric filling instruments.	**CCC**, III, BBB, KKK

A2.2.3 M27	Using input from the general technical protocol and measurement report template from A2.2.2, BBB and MMM will develop a detailed technical protocol and measurement report template for the intercomparison of the calibration of automatic catchweighers. The methods and scheduling for the comparison will be based on the partners' experience with inter-laboratory comparisons in the field of NAWIs, but will take into account the conditions typical for the dynamic mode of operation (speed/rate of operation, properties of weighed articles, dynamic setting parameter, etc.). For each category of AWI all partners in the activity will perform their measurements on the same AWI. MMM will provide access to one of their stable automatic catchweigher for the intercomparison. BBB, PPP, CCC, III, SSS, KKK and MMM will each perform a complete set of measurements on the automatic catchweigher according to the technical protocol. Each participant will produce a measurement report and a calibration certificate according to A1.3.2. The data will be analysed and a Draft A of the final report on the interlaboratory comparison of the calibration of automatic catchweighers, including a statement on the reproducibility of the methods, will be prepared by BBB. The report will be agreed with the partners and a Draft B version of the report produced. The agreed comparison report will be provided as input to A1.3.2 and used to update the draft calibration method, errors model and measurement uncertainty budget, as necessary.	**BBB**, PPP, CCC, III, SSS, KKK, MMM
A2.2.4 M27	Using input from the general technical protocol and measurement report template from A2.2.2, CCC and SSS will develop a detailed technical protocol and measurement report template for the intercomparison of the calibration of automatic instruments for weighing road vehicles in motion. In cooperation with a collaborator (probably XXX), CCC will arrange access to a stable automatic instrument for weighing road vehicles in motion. CCC, PPP, GGG, III and SSS will each perform a complete set of measurements according to the technical protocol. Each participant will produce a measurement report and a calibration certificate according to A1.3.3. The data will be analysed and a Draft A of the final report on the interlaboratory comparison of the calibration of automatic instruments for weighing road vehicles in motion, including a statement on the reproducibility of the methods, will be prepared by CCC. The report will be agreed with the partners and a Draft B version of the report produced. The agreed comparison report will be provided as input to A1.3.3 and used to update the draft calibration method, errors model and measurement uncertainty budget, as necessary.	**CCC**, PPP, GGG, IIII, SSS
A2.2.5 M28	Using input from the general technical protocol and measurement report template from A2.2.2, KKK and CCC will develop a detailed technical protocol and measurement report template for the intercomparison of the calibration of automatic gravimetric filling instruments. In cooperation with a collaborator (probably XXX), KKK will arrange access to a stable automatic gravimetric filling instrument. KKK**,** CCC, III and RRR will each perform a complete set of measurements according to the technical protocol. Each participant will produce a measurement report and a calibration certificate according to A1.3.4. The data will be analysed and a Draft A of the final report on the interlaboratory comparison of the calibration of automatic gravimetric filling instruments, including statement on the reproducibility of the methods, will be prepared by BBB and III. The report will be agreed with the partners and a Draft B version of the report produced. The agreed comparison report will be provided as input to A1.3.4 and used to update the draft calibration method, errors model and measurement uncertainty budget, as necessary.	**KKK,** CCC, III, RRR
A2.2.6 M29	CCC, PPP, GGG, III, SSS, RRR, BBB, KKK, and MMM will review the reports from A2.2.3, A2.2.4 and A2.2.5 and will send them to the coordinator. Once the calibration methods have been agreed by the consortium, the coordinator on behalf of PPP, GGG, III, SSS, RRR, BBB, KKK, and MMM will then submit them to EURAMET as **D4** *'Reports for the interlaboratory comparisons of the calibration of automatic catchweighers, automatic instruments for weighing road vehicles in motion and automatic gravimetric filling instruments'*.	**CCC**, PPP, GGG, III, SSS, RRR, BBB, KKK, MMM

Example 3: Technical tasks (SI Broader Scope project)

Task 1.1 Evaluation of the properties of materials for use as mass transfer standards to disseminate the unit of mass

The aim of this task is to evaluate the properties of at least 7 materials to assess their suitability for use as mass standards to disseminate the unit of mass from the new primary realisations. The materials will be evaluated for the properties required when used in the primary realisation experiments and as primary standards for the dissemination of the redefined unit of mass. The density, hardness, magnetic permeability and surface sorption characteristics of the materials (in increasing order of importance) will determine which are the most suitable.

Activity number	Activity description	Partners (Lead in bold)
A1.1.1 M4	The homogeneity and cleanliness of at least 7 materials will be evaluated by analysis of the topography using AFM (CCC, EEE), Perthometer (FFF) and SEM (DDD) and by analysis of the surface chemistry using XPS (EEE, FFF) and TDS (BBB). Potential materials include the platinum-iridium alloy currently used for primary mass standards, pure iridium, gold platinum alloy, stainless steel, (SS), Ni-based superalloy and single crystal tungsten	**CCC**, EEE, DDD, FFF, BBB
A1.1.2 M10	Using the same 7 materials from A1.1.1, BBB and CCC will perform heat treatment cycles over a range of durations and temperatures (a minimum of four cycles over a typical temperature range 20 °C - 120 °C for a few minutes to several hours) and then evaluate the growth of oxide layers.	**BBB**, CCC
A1.1.3 M16	FFF and AAA will evaluate the mechanical resistance and adherence of overlayers by indentation in order to evaluate the efficiency of the protective layers on the 7 materials from A1.1.1.	**FFF**, AAA
A1.1.4 M18	Following the heat treatment of the 7 materials in A1.1.2, CCC and FFF will evaluate the static charge accumulation and retention on silicon artefacts.	**CCC**, FFF
A1.1.5 M20	Using input from the evaluations of the 7 materials in A1.1.1-A1.1.4, a report will be written, led by CCC with contributions from AAA, BBB, DDD, EEE and FFF, on the properties of the 7 different materials and their suitability for use as mass standards to disseminate the unit of mass from the new primary realisations. The report will include recommendations on the most suitable materials.	**CCC**, AAA, BBB, DDD, EEE, FFF

Task 1.2: Comparison of production techniques for high quality surface finishes

The aim of this task is to test and compare production techniques used to produce high quality surface finishes for mass standards, in order to select the most efficient technique according to the material used. The finishing processes to be considered include: lapping and mechanical polishing; mechanical polishing; chemical polishing and diamond turning. A comparison of the production techniques will be made with particular reference to the surface finish which can be achieved.

Activity number	Activity description	Partners (Lead in bold)
A1.2.1 M7	AAA, EEE and CCC will produce samples with high quality surface finishes using lapping, mechanical polishing and diamond turning.	**AAA**, EEE, CCC
A1.2.2 M19	Using the samples from A1.2.1, the surface finish of the samples will be evaluated by AFM (BBB, FFF), Perthometer (AAA), optical roughness meter (CCC) X-ray reflectometer (CCC) and white light interferometry (EEE). Based on the results of this evaluation, a report will be produced by BBB with support from FFF, CCC, AAA and EEE.	**BBB**, FFF, CCC, AAA, EEE
A1.2.3 M21	Using input from A1.2.2, AAA with support from BBB, FFF, CCC and EEE will produce a flow chart for the selection of the optimised finishing technique depending on the material.	**AAA,** BBB, FFF, CCC, EEE

Task 1.3: Production of artefacts for use as mass transfer standards to disseminate the unit of mass

The aim of this task is to produce a range of artefacts for use as mass transfer standards to disseminate the unit of mass from primary realisations. The artefacts will be manufactured from the materials identified in Task 1.1 as the most suitable and using the production techniques selected from Task 1.2.

Activity number	Activity description	Partners (Lead in bold)
A1.3.1 M23	Using input from A1.1.5 and A1.2.3, CCC, DDD and EEE, in consultation with the projects advisory group (A4.1.2), will determine the range and number of artefacts to be produced as mass transfer standards to disseminate the unit of mass from primary realisations. The range of mass artefacts selected will be based the materials with the most suitable properties and where the best surface finishes can be obtained using the relevant finishing techniques identified using the flowchart from A1.2.3.	**CCC**, EEE, DDD
A1.3.2 M28	Based on the conclusions from A1.3.1, CCC, DDD and EEE will jointly manufacture the selected range of mass artefacts using the finishing techniques most suited to the individual materials.	**CCC**, EEE, DDD
A1.3.3 M32	Based on the results from A1.1.5, A1.2.2-A1.2.3 and A1.3.1-A1.3.2 CCC, EEE and DDD will write a paper on the range of artefacts produced for use as mass transfer standards to disseminate the unit of mass from primary realisations.	**CCC**, EEE, DDD
A1.3.4 M32	CCC, EEE and DDD will review the paper from A1.3.3 and will send it to the coordinator. Once the paper has been agreed by the consortium, the coordinator on behalf of CCC, EEE and DDD will then submit it to EURAMET as **D6**, *'Paper on the range of artefacts produced for use as mass transfer standards to disseminate the unit of mass from primary realisations'*.	**CCC**, EEE, DDD, BBB

4.8.4 Section CN-1: Creating impact

This work package should include all partners in a wide range of activities to disseminate the outputs of the project and to particularly encourage their uptake by end-users.

You should ensure the work package includes adequate and appropriate links with the end-user community, as well as ensuring there are adequate and appropriate links with stakeholders in standards developing organisations (and their relevant committees and working groups), regulatory bodies and industrial/policy advisory committees. You should also establish a project advisory group or stakeholder committee, in order to support interaction with the end-user community and to ensure the project can meet their needs.

It is recommended that you structure your work package into 3 tasks:

Task N-1.1 **Knowledge transfer** This task should include a wide range of activities such as establishing a stakeholder committee or advisory board, establishing and maintaining a project website, producing peer-reviewed publications, good practice guides, articles in the popular press, presentations at conferences and workshops, work with standards developing organisations, etc. The activity related to peer-reviewed publications should clearly indicate the target number of papers the project will produce and the number of these that will be collaborative publications. All peer-reviewed scientific publications must be open access (see section 29.2 of the Model Grant Agreement).

Task N-1.2 **Training** This task should include activities such as workshops or training courses organised and delivered by the project including web or e-based training and modules developed within the project but delivered as part of wider training activities e.g. as part of university course.

Task N-1.3 **Uptake and exploitation** This task should describe your plans to proactively encourage and facilitate the uptake and use of the project's outputs by relevant users in the industrial and public service communities. This may include the development of commercial measurement services, the marketing and selling of reference materials, software or other outputs. It may also include the commercialisation of specific technologies developed in project. Where these are protected by formal intellectual property (IP) such as patents you should produce a plan for managing and exploiting the IP.

For Research Potential proposals only – the consortium will need to provide information demonstrating the narrowing of the capability gap between their consortium and the wider European NMI/DI community. You should include an activity for your consortium to identify measures that they will use to demonstrate that the project has narrowed the gap between the capabilities of their consortium and other NMIs/DIs in Europe and to report the outcomes at midterm and at the end of the project.

Under the activity table you should include the sentence "All IP and potential licencing/exploitation will be handled in accordance with the Grant Agreement and Consortium Agreement."

Example: WPN-1: Creating impact

Task N-1 Knowledge transfer

Activity number	Activity description	Partners (Lead in bold)
AN-1.1.1 M36	The project will create a Stakeholder Committee of at least 20 members including CCM and BIPM representatives, balance and weight manufacturers and national accreditation and legal metrology bodies, representing at least 12 European countries. The aim of the stakeholder committee is to clarify the needs of the various interested parties and to feed these into the project. Interaction of the Stakeholder Committee will be achieved via a central website (see below) and ad-hoc meetings will be held at suitable events where the committee are in attendance.	**AAA**, all partners
AN-1.1.2 M36	A project webpage will be created on BBB website with public access and a part restricted for partners only. The webpage will be regularly updated with information such as project reports, papers published by the partners, project meetings. The part of the website with restricted access will be dedicated to exchange information and reports throughout the project. It will also include a digital archive of all presentations, reports and papers from the project.	**BBB**, all partners

<table>
<tr><td>AN-1.1.3
M36</td><td>The partners plan to present at least 4 papers at the following international conferences;
XX IMEKO world congress (Republic of Korea, 9-14 September 2019)
TEMPMEKO (Autumn 2020)
Metrologie 2020 (tbc)
NEWRAD 2021
Further relevant conferences may be identified during the project.</td><td>CCC, all partners</td></tr>
<tr><td>AN-1.1.4
M36</td><td>The partners will submit at least 15 papers in total to peer-reviewed journals during the project (all these peer--reviewed papers are identified in activities in the technical WPs.). Target journals include Metrologia, International Journal of Thermophysics, Measurement Science and Technology.
The expectations are that at least 9 out the 15 publications will be the result of a collaborative effort from partners from different countries.
The authors of the peer reviewed papers will clearly acknowledge the financial support provided through the EMPIR as required by EURAMET.</td><td>CCC, all partners</td></tr>
<tr><td>AN-1.1.5
M36</td><td>The output of this project will provide vital information for development and publication of a written mise-en-pratique for the (redefined) kilogram. Additionally, two good practice guides on weighing in vacuum and storage of mass standards will be produced as will a document outlining the impact of the redefinition of the kilogram for end users. The target audience for the good practice guides will be NMIs who maintain primary mass standards and have weighing in vacuum facilities and also watt balance and Avogadro researchers and will be available as an electronic download from the website. The guide outlining the impact of the kilogram redefinition will be aimed at a wider audience and will be produced in electronic form and as a hard copy.</td><td>CCC, all partners</td></tr>
<tr><td>AN-1.1.6
M36</td><td>To enable other interested parties beyond the thermometry community to understand the results of the projects 5 articles will be submitted to trade journals such as Physics World.</td><td>CCC, all partners</td></tr>
<tr><td>AN-1.1.7
M36</td><td>Information on the results of the project will be disseminated to a range of standards bodies and committees and feedback sought (see details below and in the table in Section B2.c).
<table>
<tr><th>Standards Committee / Technical Committee / Working Group</th><th>Partners involved</th><th>Likely area of impact / activities undertaken by partners related to standard / committee</th></tr>
<tr><td>IS0 TC/212 WG2</td><td>AAA</td><td>ISO TC212 ‘Clinical Laboratory Testing and IVDs’ aims to provide guidelines on standardisation in the field of laboratory medicine and in vitro diagnostic test systems. This includes, for example, quality management, pre- and post-analytical procedures, analytical performance, laboratory safety, reference systems and quality assurance.
This project has an expert representative on ISO TC212 WG2 (reference systems) which meets biannually in May and October.
AAA will input to the recently approved revision of ISO 17511 - Reference systems for in vitro diagnostics, through submission of a relevant case study to the proposed annex to the standard.</td></tr>
<tr><td>CEN TC/140/WG10</td><td>AAA, CCC</td><td>This CEN WG meets annually in March and it has a specific remit for the standardisation of reference method(s) for the in vitro testing of the susceptibility of bacteria, with importance in human infections, to antimicrobial agents. It also has a remit for standardisation in the field of bacteriology relating to the performance of antimicrobial susceptibility devices which are used for testing the susceptibility of bacteria to antibiotics in most medical laboratories.
AAA and CCC will discuss with the DIN secretariat whether the WG could develop a new programme of standards to capture the specific guidance generated by the project.</td></tr>
<tr><td>JCTLM, WG1 Nucleic Acid Review Team</td><td>AAA (Chair), CCC</td><td>The JCTLM NA review team meets annually in December and reviews “higher order” molecular diagnostic RMs and reference measurement procedures for clinical molecular diagnostic tests for approval and listing on the JCTLM database.
CCC, with support from AAA, will submit a JCTLM nomination for a reference method for the quantification of</td></tr>
</table></td><td>CCC, all partners</td></tr>
</table>

			antimicrobial resistant microbes by nucleic acid amplification techniques.
	CCQM Nucleic Acid Analysis Working Group (NAWG)	**AAA (chair),** DDD, CCC, EEE	NAWG meets biannually in April and October and coordinates international comparison studies to facilitate the development of traceable and comparable measurement capabilities for nucleic acids. AAA, with support from DDD, CCC and TUBITAK, will propose a CCQM NAWG study to evaluate capability for viral measurement by PCR methods.
	The representatives on the corresponding committee or WG from the partners will jointly ask the chairperson to include a point in the agenda to briefly present the outputs of the project related to the WG activities and ask for comments. Where appropriate a written report will be submitted for consideration by the committee or WG.		

Task N-1.2 Training

Activity number	Activity description	Partners (Lead in bold)
AN-1.2.1 M31	Two workshops for stakeholders will be organised and held during the project. During the first day of the kick off meeting at BBB a special 0.5 day session will be dedicated to a workshop for the stakeholder community. European NMIs and DIs that are not partners, accredited laboratories and temperature instruments manufacturers will be invited (the target number of delegates will be between 15 and 30). Possible attendees among the stakeholders and the EURAMET-TC representatives will be contacted directly by e-mail. A second stakeholder workshop (1-1.5 days' duration) will be organised and held in M30 at CCC. The workshop will be open to all NMIs, instrument manufacturers and accredited laboratories. The workshop will present the results achieved by the project but will allow time for discussion of the results with all the participating stakeholders and instrument manufacturers. The target number of delegates is around 50.	**BBB**, all partners
AN-1.2.2 M26	A two-day training course will be organised and held on the day preceding the second stakeholder workshop in M25, probably at CCC. The training course will be targeted at medical physicists, stakeholders (industrial, national authorities etc.) and will focus on the new methods and techniques developed in the project for use in hospitals and clinics. The target number of delegates is between 15 and 25. The training course will be publicised through the website and by e-mail to the TC-T members and stakeholders.	**CCC**, all partners
AN-1.2.3 M36	A video for e-training on the use of the new methods for quality controls will be developed by CCC and EEE and posted on the project website.	**CCC**, EEE

Task N-1.3 Uptake and exploitation

Activity number	Activity description	Partners (Lead in bold)
AN-1.3.1 M36	An exploitation plan will be created at the beginning of the project and reviewed and updated at least at each project meeting.	**CCC**, all partners
AN-1.3.2 M36	DDD, CCC and AAA will introduce new calibration services for low dose level miniature dosimeters based on the techniques developed in WP2.	**DDD,** CCC, AAA
AN-1.3.3 M36	Once the sensor is available from WP3 and WP4, an e-service based on dedicated software for the unfolding of the raw read-out data to derive the time and position dose distribution will be launched after the end of the project. It is intended that the sensor design will be patented after the end of the project.	**CCC**, BBB, DDD
AN-1.3.4 M34	The database of bio-chemical reference material properties will be made publicly available on the DDD's website.	**DDD**
AN-1.3.5 M36	DDD, CCC and AAA will develop new draft CMCs for the new calibration services for low dose level miniature dosimeters based on the techniques developed in WP2 and will submit these draft CMCs to EURAMET TC-IR.	**DDD,** CCC, AAA

AN-1.3.6 M18, M36	*Research Potential proposals only* The consortium will identify measures that they will use to demonstrate that the project has narrowed the gap between the capabilities of their consortium and other NMIs/DIs in Europe. Summaries will be produced at months 18 and 36, demonstrating how the project helped emerging/smaller NMIs in the consortium to develop their capabilities closer to the wider European NMI/DI level. Where appropriate this improvement will be quantified. All partners will provide input to these summaries and the coordinator will provide this information demonstrating the narrowing of the capability gap at the mid-term review and at the end of the project.	**AAA**, all partners

All IP and potential licencing/exploitation will be handled in accordance with the Grant Agreement and Consortium Agreement.

4.8.5 Section CN: Management and coordination

This work package must involve all partners as each has to contribute to project reporting and should attend project meetings. It is recommended that you structure your work package into 3 tasks:

Task N.1 Project management

Task N.2 Project meetings

Task N.3 Project reporting The dates for the submission of reporting documents will depend upon the duration of the JRP. However, there must be 2 periods and hence 2 periodic reports. Therefore for a 36 month JRP reporting documents must be submitted at months 9, 27 (+ 45 days) and 18, 36 (+ 60 days).

Under the activity table you should include the sentence "All formal reporting will be in line with EURAMET's requirements and will be submitted in accordance with the Reporting Guidelines."

Example: WPN: Management and coordination

Task N.1: Project management

Activity number	Activity description	Partners (Lead in bold)
AN.1.1 M36	The project will be managed by the coordinator from AAA, who will be supported by the project management board consisting of one representative from each partner; including the leaders of each work package. The members of the project management board will guide the project, attend the project meetings, organise the progress meetings at their local institutes and call additional meetings if needed to ensure the overall project's success.	**AAA**, all partners
AN.1.2 M36	The work package leaders will report on the on-going progress to the coordinator by e-mail and telephone conferences.	**AAA**, all partners
AN.1.3 M36	The coordinator, with support from the partners, will manage the project's risks to ensure timely and effective delivery of the scientific and technical objectives and deliverables.	**AAA**, all partners
AN.1.4 M36	The consortium will ensure that any ethics issues identified (see Section D3) are addressed.	**AAA**, all partners

Task N.2 Project meetings

Activity number	Activity description	Partners (Lead in bold)
AN.2.1 M2	The kick-off meeting involving all partners will be held approximately one month after the start of the project, at AAA.	**AAA**, all partners
AN.2.2 M36	There will be five formal project meetings. These meetings include the kick-off, mid-term (around M18) and final meeting (around M36). In addition, two further meetings will be held around M9 and M27. The meetings will be held prior to reporting. The meetings will review progress and will be used to ensure partners are clear as to their role for the next period. The location of the meetings will rotate among the partners. Where possible, meetings may be held as satellite meetings to important conferences or committee meetings.	**AAA**, all partners
AN.2.3 M36	In addition, technical meetings of work package groups may be held whenever necessary, and will be arranged on an ad-hoc basis.	**AAA**, all partners

Task N.3 Project reporting

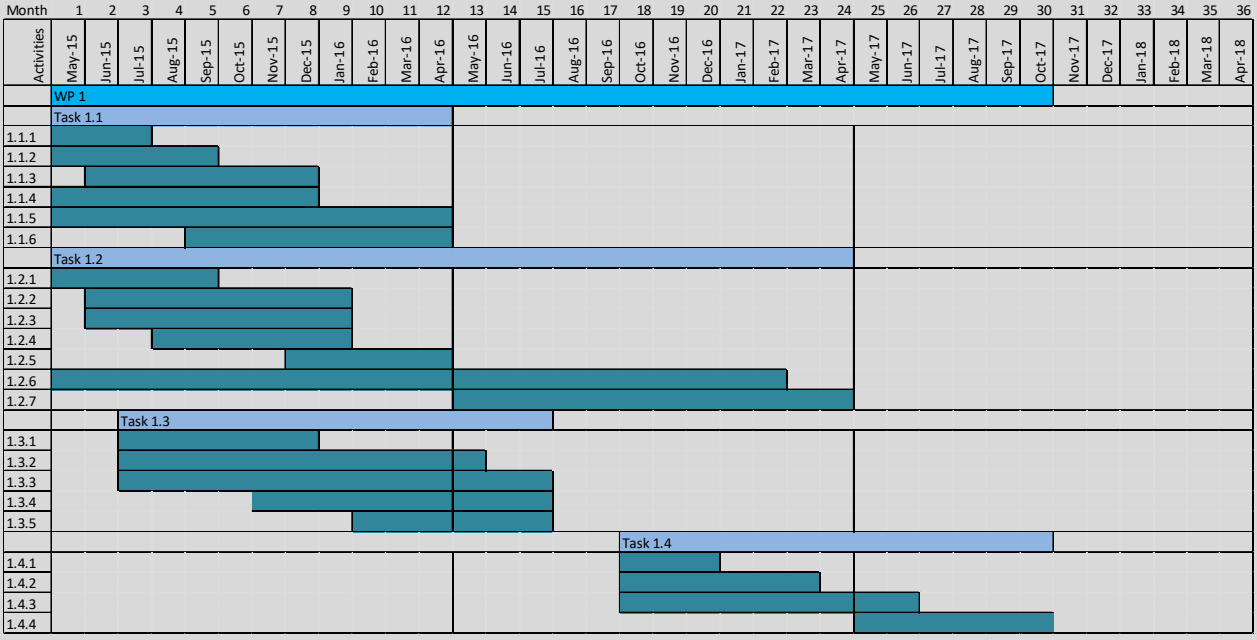
Activity number	Activity description	Partners (Lead in bold)
AN.3.1 M1	One month after the start of the project a publishable summary and data management plan (DMP) (if applicable) will be produced and submitted to EURAMET.	**AAA**, all partners
AN.3.2 M36 +60 days	Following Articles 17 and 20 of the grant agreement, information will be submitted to EURAMET, in accordance with the procedures issued by them to enable EURAMET to comply with its obligations to report on the programme to the European Commission. • Progress reports will be submitted at months 9, 27 (+ 45 days), 18, 36 (+ 60 days). • Impact/Output reports and data management plans (if applicable) will be submitted at the same times. All partners will provide input to these reports and the coordinator will provide these and updated publishable summaries to EURAMET.	**AAA**, all partners
AN.3.3 M36 +60 days	Periodic Reports (including financial reports and questionnaires) will be delivered at months 18 and 36 (+ 60 days) in accordance with Article 20 of the grant agreement. All partners will provide input to these reports and the coordinator will provide these to EURAMET.	**AAA**, all partners
AN.3.4 M36 +60 days	Final Reports will be delivered at month 36 (+ 60 days) in accordance with Article 20 of the grant agreement. All partners will provide input to these reports and the coordinator will provide these to EURAMET.	**AAA**, all partners

All formal reporting will be in line with EURAMET's requirements and will be submitted in accordance with the Reporting Guidelines.

4.9 Section CN+1: Gantt chart

The Gantt chart can be produced using MS Excel or MS Project but it must show the duration of each work package, task, and activity (by month). Please do NOT include lists of partners involved or the title for work packages or tasks.

Example: CN+2: Gantt Chart



4.10 Section D: Risks and risk mitigation

This section should be completed using the tables in Template 4: JRP protocol. You should separate your risks into 2 categories:

Section D1 **Scientific/technical risks** (problems related to the research)

Section D2 **Management risks** (problems with staff, IP etc)

PLEASE NOTE that where a collaborator is providing access to their facilities or equipment or a 'Linked Third Party' is included in your proposal you should include specific risks associated with their involvement.

Technical risks should be considered on a Task by Task, although some tasks may be grouped for identical or similar risks. For each risk, you should identify:

- What the risk is
- What is the likelihood of the risk occurring and what impact this would have on the project
- What could the consortium do to decrease the likelihood of the risk occurring (mitigation)
- What the consortium could do if despite the mitigation the risk still occurs (contingency)

Example: Section D1 scientific / technical risks

Risks (description)	**Likelihood and impact of occurrence**	**Mitigation** i.e. what the consortium will do to decrease the likelihood of the risk occurring	**Contingency** i.e. what the consortium will do if despite the mitigation the risk still occurs
Tasks 1.1-1.4: Technique A: Gas pressure deforms the capacitor, increasing the measurement uncertainty of capacitance in an unknown way	Likelihood without mitigation: High Impact: Incorrect measurement of the capacitance, will affect the uncertainty of the main result, potentially beyond 10^{-6}. Likelihood after mitigation: Low	Time will be spent on the capacitor design and this will significantly reduce this risk. Detailed investigations of the material properties and comparison of different capacitor designs will be carried out in parallel with theoretical simulations. A "go/no-go" review will assess the feasibility of overcoming the risks relating to capacitor design and use.	Should the resulting capacitor design be ambiguous, an independent laboratory could provide additional independent checking. This checking would take an additional 8 weeks.
Task 2.3: Technique B: The molar mass and the ideal gas heat capacity ratio of the gas cannot be determined with the target uncertainty of < xx %	Likelihood without mitigation: Low Impact: The uncertainty due to molar mass and heat capacity will affect the uncertainty of the EMPIR constant, potentially beyond 10^{-6}. Likelihood after mitigation: Very low	Published data values are available, and should be suitable for use. If the published values have too high an uncertainty, the lead partner will determine more accurate values anchored to an absolute calibration.	None required as the risk is low and mitigation should avoid the need for action.
Task 3.2: Poor quality of radionuclide materials for production of selected standard sources (e.g. impurities)	Likelihood without mitigation: Medium Impact: Some selected radionuclides cannot be used. Likelihood after mitigation: Low	A number of suppliers will be identified early in the project. If the purity of the radionuclides appears to be an issue different/more suppliers of radionuclide materials will be used with emphasis on their purity.	Additional purification of radionuclide materials will be performed in the partner's radiochemical laboratories.
Task 4.1: Reference clock or distribution system fails	Likelihood without mitigation: Medium Impact: Number of possible comparisons will be smaller. Likelihood after mitigation: Low	Time and frequency distribution is a key task of the participating sites. Reference clocks and microwave distribution systems are available at all partners and two partners have more than one system thus providing some back up.	If the equipment at one participating station fails, the equipment at the other three participating institutes will still be available enabling a reduced number of optical clock comparisons to be made.

Task 4.5: Unable to obtain access to collaborators'/end-users' facilities to evaluate the project devices	Likelihood without mitigation: Low Impact: Verification of the results on-site will not be possible. Likelihood after mitigation: Very low	Partners will contact collaborators at the start of the project to ensure that there are enough collaborators that have initially indicated their willingness to provide access suitable facilities so that the device can be tested on at least one site.	In the event that none of the collaborators can/will provide access to suitable facilities, the partners will hire a foundry and test the devices.
Tasks 5.1-5.3: End user installations are not available for on-site testing	Likelihood without mitigation: High Impact: Unable to undertake in-situ / on-site testing and reduced use of results by end-users. Likelihood after mitigation: Medium	The on-site testing will be planned in such a way as to avoid any interruption of the production process. Measurement results will be published as per agreement with end-users.	If, after mitigation, this cannot be achieved, the consortium will discuss the situation with EURAMET and re-scope this WP. Simulation of in-situ / on-site testing will be considered as an alternative solution.

Example: Section D2 management risks

Risks (description)	**Likelihood and impact of occurrence**	**Mitigation** i.e. what the consortium will do to decrease the likelihood of the risk occurring	**Contingency** i.e. what the consortium will do if despite the mitigation the risk still occurs
Key personnel are lost to the project	Likelihood without mitigation: Low Impact: The loss of key team members would create difficulties in delivering the project, or specific tasks or deliverables. Likelihood after mitigation: Very low	None of the team members are planning to leave or retire within the project. The grouping of experts within the consortium should minimise the areas where knowledge is held by a single person. All the partners will identify backups for key workers wherever possible to reduce the overall risk to the project. Project plans will be shared within the consortium and results and methodology will be documented.	If a key member leaves the project, then the partner concerned will be responsible for appointing a replacement. However this may still lead to a delay in delivery.
Complexity of managing a large consortium	Likelihood without mitigation: Medium Impact: Failure to fully cooperate or communicate effectively within the consortium could endanger efficient delivery of the project. Likelihood after mitigation: Low	The partners are all experienced with complex multinational projects. Many have previously developed close relationships through collaborating within other European consortia. Regular communication and feedback will ensure that potential problems are identified early and that all partners are clear on their roles.	WP leaders will play an important role in flagging up potential problems to the coordinator and the project management board, who will then decide on the best course of action to take. If necessary, work will be reassigned to an alternative partner, or parts of the work re-scoped in agreement with EURAMET.
Inter-dependencies between technical activities and tasks are too complex	Likelihood without mitigation: Medium Impact: Tasks are delayed or it is not possible to deliver them. Likelihood after mitigation: Low	Technical meetings run by WP leaders have been scheduled to ensure proper sharing of knowledge. The interdependencies between tasks will be considered at meetings to ensure that this is addressed. The technical WPs will be closely managed by their WP leaders to ensure that they deliver their own outputs.	In most cases, activities on the critical path have some overlap in time and thus a delay in the output of one deliverable does not necessarily cause an immediate delay in another.

Problems dealing with Intellectual Property (IP) ownership and/or exploitation might occur and could be a source of potential conflict	Likelihood without mitigation: Medium Impact: Disagreement between the partners could delay the project (in implementing the work and publishing results). Likelihood after mitigation: Low	All partners will sign the grant agreement and consortium agreement, which includes IP clauses.	Independent arbitrators will be used in the event of disagreement between partners.
The Linked Third Party does not deliver their key parts of the work	Likelihood without mitigation: Low Impact: Parts of the project may not be delivered effectively. Likelihood after mitigation: Very low	Under the terms of the grant agreement partner YYY would be liable for the relevant parts of the project if the Linked Third Party defaults.	If partner YYY also defaults on their obligations then the other partners become liable. The tasks affected would have to be reassigned or re-scoped in agreement with EURAMET.
A collaborator fails to provide access to facilities or equipment	Likelihood without mitigation: Low Impact: The consortium may not be able to complete the planned work, or the work might need to be delayed until another collaborator or alternative access to facilities or equipment is found. Likelihood after mitigation: Very low	The coordinator or relevant partner will liaise with the collaborator early in the project regarding access to the facilities' / equipment. All collaborators are professional organisations and experienced in working in projects. Each WP leader will work closely with each associated collaborator to report any issues back to the coordinator. Project meetings are held every 9 months, so any issues will be discussed at these meetings.	The WP leader will work with the coordinator to find an alternative collaborator or alternative access to facilities or equipment.

4.11 Section D3: Ethics

EURAMET is required by the Horizon 2020 Rules for Participation to undertake an ethics review of all EMPIR projects. This will be part of the evaluation process and there are 4 possible outcomes for a proposal following the ethics review:

1. Ethics clearance (the proposal is 'ethics ready')
2. Conditional ethics clearance (clearance is subject to conditions, i.e. ethics requirements. The requirements must either be fulfilled before grant signature or become part of the grant agreement)
3. Ethics Assessment recommended (i.e. the proposal raises serious and/or complex ethics issues)
4. No ethics clearance (the proposal will not be funded)

The MSU will complete Section D3 as part of the negotiation of successful proposals therefore please do not complete this section at the proposal stage. Examples of text included during the negotiation following the ethics review are shown below.

Example 1: Section D3 Ethics

The EMPIR Ethics Review 2014 has given JRP 14RPT99 POTENTIAL "Ethics clearance".

Third Countries

The consortium will ensure that any partners or collaborators from Third Countries fully adhere to H2020 ethics standards, no matter where the research is carried out. The consortium will also, in the case of dual use applications, clarify whether any export licence is required for the transfer of knowledge or material.

Data protection

The consortium will ensure that all participants in training activities and meetings give a valid informed consent for the processing of personal data.

Ethical integrity

The consortium will ensure that the ethical policy to be followed in the project complies with the highest standards of research integrity (as set out in the European Code of Conduct for Research Integrity).

Example 2: Section D3 Ethics

The EMPIR Ethics Review 2014 has given JRP 14IND88 MATERIALS “Conditional ethics clearance”.

Third Countries

The consortium will ensure that any partners or collaborators from Third Countries fully adhere to H2020 ethics standards, no matter where the research is carried out. The consortium will also, in the case of dual use applications, clarify whether any export licence is required for the transfer of knowledge or material.

Data protection

The consortium will ensure that all participants in training activities and meetings give a valid informed consent for the processing of personal data.

Ethical integrity

The consortium will ensure that the ethical policy to be followed in the project complies with the highest standards of research integrity (as set out in the European Code of Conduct for Research Integrity).

Dual use

The ethics reviewers identified that the project aims to address the strength of materials. The objectives do not have direct dual use implications but the indirect dual use risks must be monitored and addressed as the research proposed deals with the issue of "strength of materials". The idea that the ultimate strength comes from the strength of the chemical bonds which hold it together indicates that any research on this topic could have dual use implications and this must to be assessed and monitored throughout the project life time by the consortium as a contractual obligation.

The consortium will assess and report on the potential of dual use applications and, if applicable, how dual use risks can be mitigated. The report will be submitted after the grant signature, with the last technical report. As the dual use issue is an ongoing issue it will be continuously assessed during the entire course of the project.

4.12 Section E: Operational capacity

EURAMET is required by the Horizon 2020 Rules for Participation to assess the Operational capacity of all partners in a proposal to deliver EMPIR projects. This will be part of the evaluation process and carried out by the referees. Section E asks for information on each partner in order to allow the referees to make their judgement on whether each partner has the necessary basic operational capacity to carry out their proposed activities.

Therefore, for each partner, you should write a description, including key roles and contributions (usually half a page per partner) and include:

- A brief curriculum vitae or description of the profile of the organisation and persons who will be primarily responsible for carrying out the proposed research;
- A description of any significant infrastructure and/or any major items of technical equipment, relevant to the proposed work;
- A list of up to five relevant previous projects or activities;
- A list of up to five relevant publications, and/or products, services (including widely-used datasets or software), or other relevant achievements;
- A description of any third parties that are not represented as project partners, but who will nonetheless be contributing towards the work (e.g. providing facilities, computing resources). This description is only required for third parties which supplement the infrastructure of a partner – it should NOT include collaborators.

For the proposed coordinator please also include evidence of their experience in managing similarly complex and large projects.

Please note that if your project is selected for funding this section will be deleted before the grant agreement is issued.

4.13 Section F: Potential collaborators

You should add details of any potential collaborators to the table in Template 4: JRP protocol, identifying the work packages where they plan to collaborate and their role.

Please note that if your project is selected for funding this section will be deleted before the grant agreement is issued.

4.14 Section G: References

All references, other than those identified under the individual partners in Section E, should be listed in this section. Please only include key references.

4.15 List 4: Checklist for Template 4

To help you complete your JRP proposal the MSU has identified a number of common issues with proposals submitted in previous Calls, and produced List 4: Checklist for Template 4. The purpose of List 4 is to allow proposers to review their completed JRP proposals and check that all necessary information is included prior to submission.

5 Evaluation

5.1 Evaluation criteria

The evaluation criteria for proposals are described in Guide 6: Evaluating EMPIR projects. They are:

1. Excellence.
2. Impact.
3. The quality and efficiency of the implementation.

Due to the limited time EURAMET has between announcing the selection of projects and contract signature, opportunities for negotiation will be limited and therefore referees will evaluate each proposal as submitted and not on its potential if certain changes were to be made.

If the referees identify shortcomings (other than minor ones and obvious clerical errors) in the proposal, they will reflect these in a lower score for the relevant criterion.

Proposals with significant weaknesses that prevent the project from achieving its objectives or with resources being seriously over-estimated will not receive above-threshold scores.

5.2 Evaluation meetings

The dates for evaluation meetings will be given on https://msu.euramet.org/. The evaluation of JRP proposals will usually take place at a review conference, although evaluation at a consensus group meeting is possible (see the table of Budget and Features for each Call for details). In the case of a review conference:

- One representative only of each consortium must attend the review conference
- The representative must present a poster and answer referees' questions
- Following this the referees will privately agree consensus marks for each proposal

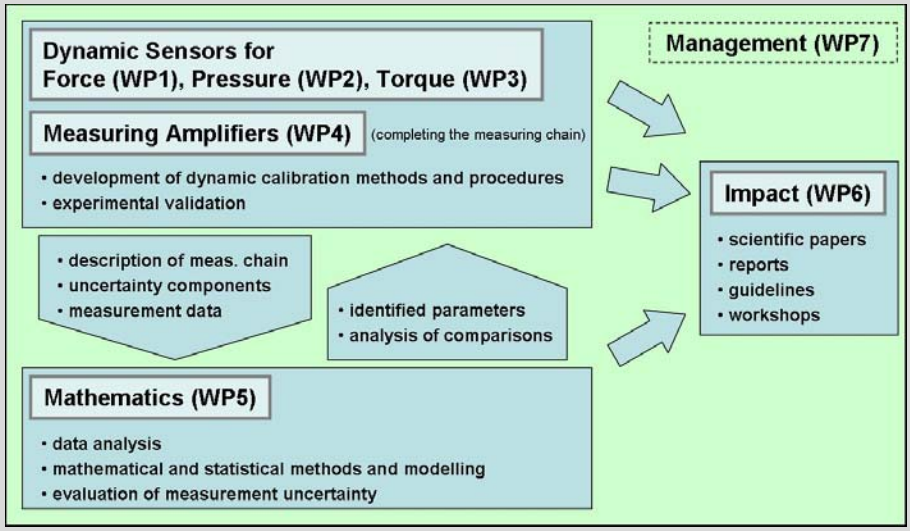
5.3 Preparing a poster for the review conference

In the case where a JRP proposal is evaluated at a review conference, every consortium must prepare a poster for the event. The poster should not be laminated nor attached to a hardboard backing. The poster should:

- Have a portrait orientation and a maximum size of A0 (841 mm × 1189 mm)
- Present the key aspects of your proposal in a clear and concise manner
- Help the referees evaluate your proposal against the 3 evaluation criteria

You may also wish to include a diagram of how the work packages fit together. At past review conferences, consortia have also provided individual A4 copies of their posters to referees.

Example of a work package diagram for a review conference poster



Organisations' logos should only be included on review conference posters where (i) the organisation is a project partner or (ii) the organisation has specifically supported the project i.e. through a letter of support.

6 Contractual requirements after selection

The Horizon 2020 Rules for Participation require EURAMET to sign Grant Agreements within 8 months of call close. The dates for the expected announcement of selection and the consequential time-frame for negotiation are given in the table of Budget and Features for the Call. If your proposal is selected for funding you will be invited to take part in grant preparation; this may cover any scientific, legal or financial aspects of the proposal, based on the comments of the referees or other issues.

EMPIR Call Process
List 4: Checklist for Template 4

Document: P-CLL-LST-102 Version: 1.2
Approved: EMRP Programme Manager 2017-06-08

This checklist supplements Guide 4: Writing Joint Research Projects (JRPs) and Template 4: JRP protocol. Its purpose is to allow proposers to review their completed JRP proposals and check that all necessary information is included prior to submission.

Overall checks	√
Ensure you are using the latest version of Template 4: JRP protocol and that all mandatory sections have been completed	
Ensure all partners have a PIC and have been validated in the European Commission's Beneficiary Register (previously known as the URF) or by EURAMET. This is particularly relevant for External Funded Partners and Unfunded Partners.	
Do NOT delete the automatic footers	
Define abbreviations the first time they are used. Include a Glossary if there are a lot of abbreviations	
Photographs should NOT be included. Diagrams should only be included if ABSOLUTELY necessary and limited to one or two schematic diagrams in Section B	
Lists of references should ONLY be included in Sections E and G	
Names of individuals should ONLY be included in Section E	
Potential collaborators should ONLY be listed in Section F	
Title page: includes the JRP number, short name, full title, requested start date, the coordinator's name and organisation. The data is consistent with the information in Template 5: Project Administrative Data	
Text lengths for Sections B1.a, B2.a, B2.b, B2.c, B2.d, B2.e and B3.a do not exceed the maximum limits	

Section A: Key Data	√
Section A1: the Coordinator (and Chief Stakeholder for Pre & Co-Normative proposals) contact details table(s) is/are consistent with the information in Template 5: Project Administrative Data	
Section A1: Participant details: all partners are listed in the correct order (Coordinator, Internal Funded Partners, External Funded Partners, Unfunded Partners) with the correct names and are consistent with Template 5: Project Administrative Data (see List: 1a).	
Section A2: Financial summary table is consistent with Template 5: Project Administrative Data. Any subcontracting is be explained under the A2 table.	
Section A3: the Work packages summary table is consistent with the information in Section C and Template 5: Project Administrative Data. Only one partner is shown as leading each WP (shown in bold)	
Section A3: if your JRP includes a Linked Third Party the following sentence is included under the Work packages summary table "*Some of the staff working on the JRP at YYY are employed by the Linked Third Party NNN. NNN will provide N months of labour resource overall to this JRP in WPX, WPY and WPZ. This resource is included in the table above."* with the number of person months the Linked Third Party will provide to each WP	

Section B1: Scientific and/or technical excellence	√
Section B1a: summarises sections B1.b, B1.d, and B1.e, is suitable for a non-specialist audience and excludes any confidential material or SRT references	
Section B1b: the scientific and technical objectives are clear and (where possible) quantitative. Each objective indicates which work package(s) (WP) it relates to.	
Section B1b: any divergence from the SRT objectives is identified and the reasons for this explained	
Section B1c: a maximum of 10 deliverables are included, 6-8 technical deliverables plus a mandatory deliverable for impact and a mandatory deliverable for the completion of the project's reporting	

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Section B1c: the deliverables align with the scientific and technical objectives and are evidence of a tangible high-level project output, such as the key output of a WP	
Section B1c: the deliverable descriptions include parameters, ranges and target uncertainties (where appropriate) and the deliverable types are suitable for delivery to EURAMET and storage	
Section B1c: for each deliverable the number of the activity where the deliverable is delivered to EURAMET is included in the first column of the deliverable table under the objective number(s)	
Section B1d: explains a clear need for the project, including the background to the need and the key issues i.e. who needs the improved measurement capability and why do they need it	
Section B1d: identifies any European legislation (Directives and/or Regulations) and/or drivers from existing industrial or policy advisory committees that demonstrate the need for the project	
Section B1d: explains why it is appropriate for EMPIR to support this proposal if a commercial organisation stands to benefit	
Section B1e: describes the current state of the art and progress beyond for each of the scientific and technical objectives of the project. The current state of the art and the progress should be clearly differentiated. PLEASE NOTE in Research Potential projects this may be equivalent to the current capabilities and how they will be improved	
Section B1e: the current state of the art and the progress beyond is numerically quantified e.g. current/target ranges and uncertainties and the key problems/challenges are identified	
Section B1e: any relevant, existing or previous EMRP/EMPIR projects have been identified and how the proposal will build on them has been outlined	

Section B2: Potential outputs and impact from the project results	√
Section B2a: describes the direct impact of the project on relevant user communities, including details of who will benefit from this research, which aspects each stakeholder group will benefit from and how you will ensure the maximum benefits are achieved PLEASE NOTE This section may be less relevant for Fundamental projects	
Section B2b: describes the direct impact of the project on the metrological and scientific communities	
Section B2c: describes the direct impact of the project on relevant documentary standards, including the partners' representation on relevant standards committees PLEASE NOTE This section may be less relevant for Fundamental projects	
Sections B2a, B2b and B2c: the impact is consistent with the activities in the "Creating Impact" WP	
Section B2d: explains why your project is important and describes the wider (i.e. longer-term) impacts that your project will contribute to and the routes to facilitate them, including economic, social and environmental wider impacts (where possible quantitatively) and who will benefit from them	
Section B2e: explains the data management plan for the project and is consistent with the information in Template 5: Project Administrative Data. A clear statement indicating whether the project 'Opts in' or 'Opts out' of data management is included.	

Section B3: The quality and efficiency of the implementation	√
All partners are included on a partner by partner basis and their contribution to the project is explained	
Explains how the consortium makes the best use of the available capabilities	
Does NOT include collaborators or names of individuals	

Section C: Detailed Project Plans By Work Package	√
Contains: a maximum of 5 technical work packages, 1 "Creating Impact" WP (mandatory), 1 "Management and Coordination" WP (mandatory)	
Each technical WP and technical task has a title that describes the work to be done, has a stated aim which is clear and concise and includes targets uncertainties and ranges where appropriate	

Each technical WP description is a maximum of 0.5 of a page and includes an aim, overview of the background, key challenges and explains how the tasks fit together	
All activities are in the required table format as per Guide 4: Writing Joint Research Projects (JRPs) and only one partner is leading each activity (shown in bold)	
The partners involved in each activity have a clear description of their work, including how the work will be split between the various partners involved	
For each activity sufficient details are included to explain clearly the work to be done, e.g. the number or types of samples to be used, the selection criteria, parameters and target uncertainties are listed, etc.	
If an activity relies on input from another activity, the text includes a reference to that dependency (e.g. using input from A1.2.1)	
The end date of each activity is included in the first column under the activity number (these dates replace information previously included in the 'Summary list of all activities') Activities are be scheduled so that all necessary inputs will be available in time	
For each technical deliverable an activity is included for the submission of the deliverable to EURAMET	
If a task includes a subcontracted activity, the subcontracting is described in the relevant activity	
If your JRP includes a Linked Third Party, they are NOT mentioned in the activities, but a sentence similar to "*The Linked Third Party NNN will work with partner BBB on this task*." is included under the activities table	
Creating Impact WP: includes activities for Knowledge transfer; Training and Uptake and exploitation. Knowledge transfer activities should include project website(s), peer-reviewed papers, trade articles, conference presentations, standards activities, project stakeholder committee/advisory group and Good/Best Practice Guides.	
Creating Impact WP: submission of peer reviewed papers includes target journals and (if appropriate) the number of papers that will be in addition to those identified in the technical WPs. Submission of conference presentations/papers includes target conferences and dates and locations (if known)	
Creating Impact WP: project workshops, training courses etc. describe their purpose, how they will be advertised, who the target audience is, the number of attendees, when will they be held and the duration	
Creating Impact WP: ***Research Potential proposals only*** An activity has been included in the Uptake and Exploitation Task for to identify measures that they will use to demonstrate that the project has narrowed the gap between the capabilities of their consortium and other NMIs/DIs in Europe and to report the outcomes at midterm and at the end of the project.	
Creating Impact WP: the statement "*All IP and potential licencing/exploitation will be handled in accordance with the Grant Agreement and Consortium Agreement*." is included under the Uptake and exploitation activity table	
Management and Coordination WP: includes activities for Project management; Project meetings (include the number of meetings and their frequency); and Project reporting	
Management and Coordination WP: the statement "*All formal reporting will be in line with EURAMET's requirements and will be submitted in accordance with the Reporting Guidelines*." is included under the activity table for Project reporting	
Gantt Chart: each activity is shown as a separate line (see Guide 4: Writing Joint Research Projects (JRPs))	
Gantt Chart: does not include a list of the partners involved nor the full titles of WPs, tasks or activities	

Section D: Risk and Risk Mitigation	√
Each risk identifies: • What the risk is (including the Task or Activity they relate to) • What the likelihood is of the risk occurring and what impact this would have on the project • What you could do to decrease the likelihood of the risk occurring (mitigation) • What you could do if despite your mitigation the risk still occurs (contingency)	
Specific risks are included where a collaborator is providing access to their facilities or equipment or a 'Linked Third Party' is included in your proposal	
Key challenges identified in the technical WPs have an associated risk	

Appropriate management risks are included, see Guide 4: Writing Joint Research Projects (JRPs) for examples	
Section D3 is left blank at proposal stage	

Section E: Operational Capacity	√
Partners are listed in the correct order as per Section A and Template 5: Project Administrative Data. Linked Third Parties are included at the end of Section E. Do NOT include collaborators	
Each partner's subsection is 0.5 page, with a maximum of 5 references per partner	
Any significant infrastructure and/or any major technical equipment, relevant to the project is included	
Evidence of the experience of the coordinator in managing similarly complex and large projects is included	

Guide 5: Submitting administrative data for EMPIR projects

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CONTENTS

If you require further help or guidance after reading this document, please contact the helpdesk

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1 Scope

This document describes the administrative data and the identification of the resources required for a Joint Research Project (JRP), Joint Network Project (JNP), or a Support for Impact Project (SIP) proposal for an EMPIR Call. It includes information on how to complete Template 5: Project Administrative Data and examples to help you.

It does not include information on:

- eligibility, this is described in Guide 1: Admissibility and Eligibility for EMPIR Calls
- writing a proposal, this is described in Guide 4: Writing Joint Research Projects (JRPs) and Guide 7: Writing Support for Impact Projects (SIPs) and Guide 11: Writing Joint Networking Projects (JNPs)
- eligibility of costs, this is described in the European Commission's Horizon 2020 Annotated Model Grant Agreements ('AGA'). To help locate the relevant section within the AGA, this Guide references specific pages of the current version (*V4.1 Oct 2017*) of the AGA at the time of issue of this Guide. If the European Commission releases a new version then the page references may vary slightly from those given in this Guide.
- reporting obligations, these are included in the model contracts and are elaborated in the EMPIR Reporting Guidelines.

2 Background

If your proposal is successful the data in Template 5: Project Administrative Data will be used to generate a single page Annex 2 to the Grant Agreement summarising the estimated budget.

Your completed Template 5: Project Administrative Data must be submitted as an .xlsx file. It must not be password protected or be a shared file. Files that are protected with a password may be deemed inadmissible.

Projects may include four types of participant:

- Internal Funded Partner(s)
- External Funded Partner(s)
- Unfunded Partner(s)
- And rarely, Linked Third Parties

If you think you will need to include a Linked Third Party, please contact the EURAMET Management Support Unit (MSU).

(Further explanation of the participant types is given in Guide 1: Admissibility and Eligibility for EMPIR Calls).

Whilst all Internal Funded Partners must take note of their country's national commitment across all projects, there is no 'pre-defined share' of an individual project for any funded partner i.e.

- A country with a small national commitment may play a significant part in an individual project.
- A country with a large national commitment may only make a small contribution to a project.

It is important that the participants provide a realistic estimate of all the resources (including labour) required to deliver all aspects of the work described in the Template 4: JRP protocol, the Template 7: SIP protocol or the Template 11: JNP protocol for which they are responsible.

It is not acceptable for a funded partner to plan to deliver some tasks in the project on an unfunded basis using resources (including labour) outside the project. It is however possible for an organisation to take part in a project as an Unfunded Partner, even if they are eligible for funding (e.g. to increase their involvement in EMPIR).

When a consortium submits a Template 4: JRP protocol or Template 7: SIP protocol or Template 11: JNP protocol and Template 5: Project Administrative Data they are effectively agreeing that the work can be delivered for the **resources and eligible costs** indicated (and not just that they are willing to deliver it for the level of EU Contribution indicated).

Please ensure that the estimates for the eligible costs for your project are as realistic as possible, because:

- If consortia over-estimate their eligible costs then fewer projects will be funded
- If consortia underestimate the eligible costs they may not be able to reclaim everything they have spent. This is because if an organisation exceeds their indicative budget, they cannot automatically receive funding for additional costs unless other partners under-spend.

It is the responsibility of each participant (and not the coordinator or EURAMET) to ensure that the relevant internal processes have been followed regarding the agreement to provide the resources and financial and administrative data that is submitted.

In addition, each organisation should be consistent in its costing approach across all projects.

3 Call budget

The budget for the call is given in the table of budget and features for the Call. This table includes the expected EU Contribution for successful projects in each TP, the maximum EU Contribution for an individual project and the expected EU Contribution to the external funded partners in any project (% of total EU Contribution). Individual SRT documents also give further guidance.

4 Completing "Template 5: Project Administrative Data"

Template 5: Project Administrative Data is comprised of a number of worksheets:

- **'Financial Summary'** includes auto-populated data and summarises the resource and budget information.
- '**Top Level data'** requires entry of key information about the project overall and also includes a number of statements that participants must agree to before submitting the proposal.
- **'Participant data'** requires entry of key information about the project participants and the resource and cost estimates.
- '**WP months data'** requires entry of the breakdown of months by work package and participant. It should be completed after all the information has been entered on the **'***Participant data'* worksheet.
- **'A', 'B' and 'C'** contain auto-populated data and tables to be pasted into the Template 4: JRP protocol, the Template 7: SIP protocol or the Template 11: JNP protocol
- **'TP Facilitator'** contains a summary that should be sent to the TP facilitator.
- **6 'Comments'** worksheets:
  - Labour,
  - Subcontracts,
  - T&S (Travel and Subsistence),
  - Equipment,
  - Int charges (Internally Invoiced Goods and Services),
  - Other (Other Goods and Services),
  - LRI (Large Research Infrastructure).

A key is given at the top of the 'Top Level data' and 'Participant data' sheets in the workbook to indicate which coloured cells require data to be entered, selected from a dropdown menu, or are auto filled.

Please do not delete or hide or insert lines or columns or overwrite equations or attempt to change any information in the white or grey cells.

5 Financial summary

This worksheet summarises the financial information and provides an overview once all data is entered.

No data is entered in this worksheet as all items are auto populated. To make any corrections, please correct the data in either the 'Top Level data' or 'Participant data' worksheets as appropriate.

6 'Top level data' worksheet

Information on the 'Top Level data' worksheet is grouped into 6 sections (A-F) covering the project itself (A), the coordinator and coordinating organisation (B), information required by the European Commission (C), SIP

and Pre & Co-Normative JRP specific information (D), workbook version details (E), data management (F) and declarations (G).

In ***section A*** select the project from the dropdown list.

Please enter a suggested short name /acronym for the proposal (a maximum of 13 characters including spaces).

For SIPs only, please select the JRP(s) that the SIP follows on from using the dropdown list.

Enter the preferred start month for the project – the start date will always be the first day of a month.

Enter the duration of the project in months (the duration must be an integer number of months).

In ***section B*** select the coordinator's organisation from the dropdown list.

Enter the name and contact details of the coordinator and that of any project administrative support person that the coordinator anticipates to have in place.

Section C includes some information that the European Commission require from EURAMET, including information on the contribution of all EMPIR projects to H2020 objectives related to climate action, sustainable development and biodiversity. Please read the definitions of climate action, sustainable development and biodiversity and the statements below and then in the 'Top Level data' worksheet select the statement that most closely applies to your project for each of climate action, sustainable development and biodiversity.

CLIMATE ACTION	DEFINITION: climate action includes both mitigating climate change (contribution to the reduction of greenhouse gas emissions) and adapting to climate change by building resilience (e.g. regarding floods, droughts, extreme weather events, protection of coastal areas).
statement 1	This project is not targeted at climate action.
statement 2	In this project climate action is a significant but not predominant objective. Climate action objectives (although important) are not one of the principal reasons for undertaking this project.
statement 3	In this project climate action is the principal (primary) objective. Climate action objectives can be identified as fundamental in the design and impact of this project, and are an explicit objective of the project.

SUSTAINABLE DEVELOPMENT	DEFINITION: a project contributes to sustainable development if its aim is to add to economic, social and natural dimensions in a way that does not diminish the availability and quality of those dimensions for future generations. 1. **The Economic dimension** is enriched by activity that provides economic added value through new technologies, products, services, governance or business models that improve competitiveness and prosperity, and promote job creation or safeguard jobs, together with related policies. 2. **The Social dimension** is understood to comprise human health, quality of life, safety and security of individuals and populations, culture, skill formation, social integration and inclusion, poverty reduction, effective and democratic governance, and related policies. 3. **The Natural dimension** is understood to comprise natural resources and ecosystems, and the biodiversity that underpins them.
statement 1	Sustainable development is not an objective for this project and it contributes to either only one or none of the 3 dimensions.
statement 2	In this project sustainable development is a significant but not predominant objective. This project aims to add to more than 1 dimension (i.e. economic, social and natural dimensions).
statement 3	In this project sustainable development is its principal (primary) objective. This project aims to contribute to the formation of all 3 dimensions (i.e. economic, social and natural dimensions).

BIODIVERSITY	DEFINITION: the conservation, restoration and sustainable management of biodiversity (ecosystems, species and genetic diversity) and the maintenance of related ecosystem services.
statement 1	This project neither directly nor indirectly seeks to contribute significantly to the conservation, restoration or sustainable management of biodiversity and the maintenance of related ecosystem services.
statement 2	In this project conservation, restoration and sustainable management of biodiversity and the maintenance of related ecosystem services are one of the principal reasons for undertaking the project. The expected effects on/benefits for biodiversity and related ecosystem services are significant but not the primary intended effect of the project.
statement 3	In this project conservation, restoration and sustainable management of biodiversity (ecosystems, species and genetic diversity) and the maintenance of related ecosystem services is the primary objective and is expected to lead to direct effects/benefits with regard to biodiversity. The project would not have been carried out in the absence of such objectives/intended effects for the conservation and restoration of biodiversity.

Please provide an estimate of the % of the project resources spent on work related to documentary standards (EURAMET expects this to be at least 10 % averaged across all projects in EMPIR).

In ***section D***, enter the requested information about the primary supporter of a SIP, or the chief stakeholder for a Pre & Co-Normative JRP (this should be identical to the details given in the protocol).

In ***section E*** please include the version details for the workbook (the version number should be in the form pX ≡ proposal version X). If updated versions of the proposal documents are submitted to EURAMET, please ensure that if a new version of the workbook is submitted to EURAMET in the ZIP file, that the workbook includes a new version number and version date.

In ***section F*** please indicate whether the project will 'opt-in' or 'opt-out' of the Data Management Plan reporting (as per the protocol). See Guide 4 (JRPs) section 4.6.5, Guide 7 (SIPs) section 5.6.2 or Guide 10 (JNPs) section 4.6.3 as appropriate.

In ***section G*** please read the declarations at the bottom of the worksheet related to ethics, research integrity and dual use. Proposers should note that by submitting their proposal they are confirming that they comply with the declarations on the 'Top level data' worksheet.

7 'Participant data' worksheet

7.1 Participating legal entities

This section relates to columns F-H of the 'Participant data' worksheet.

Participants should be entered in the following order:

- Coordinator, Internal Funded Partner (Partner 1).
- Other Internal Funded Partners (alphabetical order by legal entity short name).
- External Funded Partners (alphabetical order by legal entity short name).
- Unfunded Partners (alphabetical order by legal entity short name).
- Linked Third Parties (numerically by partner number of the partner they link to, then alphabetical order by legal entity short name).

Explanation of the participant types is given in Guide 1: Admissibility and Eligibility for EMPIR Calls. Some of the information for the coordinator will be automatically populated.

Select the legal entity from the dropdown list. The list is sorted by country and then by the legal entity short name. Where the legal entity is representing Europe and not just the country where it is registered (e.g. JRC, CERN) then the legal entity is listed under Europe. Other information already known to EURAMET will be automatically populated. (Changes to such details should be made directly by the organisation to EURAMET, separately from a project proposal).

Where the legal entity of the participant is not on the dropdown list select "New participant" (the last option of the list) and enter all details accordingly. For Internal Funded Partners, the short name of the legal entity that

can participate in EMPIR projects (i.e. those to be selected here) is given on List 1a: NMIs and DIs that are known to EURAMET that can participate in EMPIR projects. (Note that the legal entity short name and full legal names are not necessarily the same as that of the institute)

If you are unable to select an Internal Funded Partner please contact the EURAMET MSU.

7.2 Estimated resources

This section relates to columns M-Y of the 'Participant data' worksheet.

An estimate of hours and costs is required for all participants whether or not they are funded (i.e. Internal Funded Partners, External Funded Partners, Unfunded Partners and Linked Third Parties).

Costs are required in a number of categories. Refer to Article 6.1 (*p39 in V4.1 Oct 2017*) of the European Commission's Horizon 2020 Annotated Model Grant Agreements ('AGA') for clarification of the eligibility of all costs, and also to Article 6.5 (*p121 in V4.1 Oct 2017*) of the AGA for clarification of costs that are not eligible.

Each cost category has additional specifications for eligibility which are referenced here and also in the 'Participant data' worksheet:

- Labour: Article 6.2A (*p45 in V4.1 Oct 2017*) of the AGA
- Subcontracts: Article 6.2B (*p80 in V4.1 Oct 2017*) and Article 13 (*p143 in V4.1 Oct 2017)* of the AGA
- Travel and Subsistence: Article 6.2D1 (*p82 in V4.1 Oct 2017*) of the AGA
- Equipment: Article 6.2D2 (*p84 in V4.1 Oct 2017*) of the AGA
- Other Goods and Services: Article 6.2D3 (*p89 in V4.1 Oct 2017*) and Article 10 (*p133 in V4.1 Oct 2017*) of the AGA
- Large Research Infrastructure: Article 6.2D4 (*p92 in V4.1 Oct 2017*) of the AGA
- Internally Invoiced Goods and Services: Article 6.2D5 (*p103 in V4.1 Oct 2017*) of the AGA
- In kind contributions not used on the premises: Article 6.4 (*p120 in V4.1 Oct 2017)*, Article 11 (*p136 in V4.1 Oct 2017)* and Article 12 (*p140 in V4.1 Oct 2017*) of the AGA

Explanations for all costs entered on this worksheet should be entered in the appropriate 'Comments' worksheets (see section 11).

All costs should be estimated in Euros (estimates to the nearest 500 Euros are sufficient).

Time resources should be estimated in hours (estimates to the nearest 100 hours are sufficient).

The time resources are automatically converted into units of 'EURAMET months' as defined by EURAMET for administration purposes. (Note that an individual working full time on a project will not achieve 12 'EURAMET months per year' but approximately 10, due to public holidays, holidays etc.)

7.2.1 Labour hours

An estimate of the hours should be entered (an estimate to the nearest 100 hours is sufficient).

In the case of SME owners or natural persons, not receiving a salary (see Articles 6.2.A4 & 6.2.A5 (*p48, p78 in V4.1 Oct 2017*) of the AGA for clarification of this category), their hours should be separately identified and included in the separate 'Hours Labour (C)' column. Entering hours of this type (C) will require some columns to be unhidden, following the instructions given in cell 1M).

7.2.2 Labour costs

There are three different types of labour costs (a participant may have data in more than one type). Refer to *Article* 6.2 (*p46 in V4.0 Apr 2017)* of the AGA for clarification of costs eligible in this these categories.

- **Labour (type A)**

  For organisations which will report labour costs based on 'actual personnel costs' labour methodology. This option must be used by those organisations that are not able to report costs using either of the two types below. Type A is the most commonly reported labour type.

- **Labour (type B)**

  For organisations which will report labour costs based on 'average personnel costs' labour methodology. (Note that 'average personnel costs' may also be referred to as 'unit costs' in the AGA).

  It is recommended that participants should only plan for this type of labour costs if they already have well established hourly rates per pay zone (approved by their own auditor) which they use for costing and charging for work for customers. If this is not the case, then significant changes will need to be made to the financial procedures within the organisation in order for costs based on this labour type to be eligible when reported.

- **Labour (type C)**

  Labour costs of SME owners who are not receiving a salary and natural persons who are not receiving a salary.

7.2.3 Subcontract costs

Refer to Articles 6.2B (*p80 in V4.1 Oct 2017*) and Article 13 (*p143 in V4.1 Oct 2017)* of the AGA for clarification of costs eligible in this category.

Subcontracting refers to the subcontracting of activities described in the protocol. It is generally regarded as an exception to subcontract research activities, as participants should have the necessary resources to undertake the work themselves, however it is not uncommon for web design and technical writing, for example of newsletters, to be subcontracted. Note that subcontracting of any research will require advance approval from the EURAMET MSU before the costs can be reported. However approval is not required in order to include subcontracting in the proposal.

7.2.4 Travel and Subsistence (T&S)

Refer to Article 6.2D1 (*p82 in V4.1 Oct 2017*) of the AGA for clarification of costs eligible in this category.

Some examples of items covered in this category are:

- attendance at project meetings,
- attendance at a workshop,
- presentation of the project at a conference,
- visit(s) or secondment(s) to another participant in the project to undertake joint testing.

T&S costs for secondments should be assigned to the employing organisation of the secondee, not the host organisation.

Organisations which usually incorporate their T&S costs within their overhead as standard practice, should not enter any budgeted costs for T&S, but should record information about their planned travel on the 'Comments-T&S' worksheet.

7.2.5 Equipment

Refer to Article 6.2D2 (*p84 in V4.1 Oct 2017*) of the AGA for clarification of costs eligible in this category.

This category covers

- depreciation costs of capital equipment. (Note that deprecation of capital equipment is only eligible if the organisation normally allocates capital equipment usage to projects rather than to overheads. Very few Internal Funded Partners do so. Please consult your finance department and/or auditor before including significant values in this category.)
- renting or hiring of facilities,
- purchase of equipment which is required solely for the project and is not normally treated as an asset according to the organisations asset procedures

One of the aims of EMPIR is to make more effective use of existing specialist facilities and capabilities, therefore EURAMET will need to specifically approve the inclusion of any items of significant cost before the costs can be reported. However approval is not required in order to include equipment costs in the proposal.

7.2.6 Internally Invoiced Goods and Services

Refer to Article 6.2D5 (*p103 in V4.1 Oct 2017*) and Article 10 (*p133 in V4.1 Oct 2017*) of the AGA for clarification of costs eligible in this category.

This category covers the costs for goods and services which the beneficiary itself will produce or provide for the action. Some examples of items covered in this category are: self-produced consumables (e.g. electronic wafers, chemicals); use of specific research devices or research facilities that are owned by the participant (e.g. clean room, wind tunnel, supercomputer facilities, electronic microscope, beam line, nanofabrication facilities, engineering workshop); hosting services for visiting researchers participating in the action (e.g. housing, canteen).

7.2.7 Other goods and services

Refer to Article 6.2D3 (*p89 in V4.1 Oct 2017*) and Article 10 (*p133 in V4.1 Oct 2017*) of the AGA for clarification of costs eligible in this category.

Some examples of items covered in this category are:

- Consumables
- Registration fees for workshops or conferences
- Logistics costs such as catering for a meeting
- Engineering workshop costs
- Reimbursement of T&S costs for invited speakers at a workshop organised by the project
- Fees for publications in open access journals
- Costs of making data FAIR (i.e. for Data Management Planning)
- Cost of temporary work agency for using/hiring temporary personnel
- Courier costs
- Financial audit costs
- Costs related to protection of foreground IPR
- Costs relating to a financial guarantee (if required)

Please note that each partner must ensure open access (free of charge online access for any user) to all peer-reviewed scientific publications relating to the project's results (see section 29.2 of the Model Grant Agreement). Any related fees are eligible costs and should be included in the budget.

7.2.8 Large Research Infrastructure (LRI)

Refer to Article 6.2D4 (*p92 in V4.1 Oct 2017*) of the AGA for clarification of costs eligible in this category.

This is only applicable for cases where the European Commission has approved the organisation's methodology for declaring costs for the large research infrastructure. However, costs may be budgeted for here even if the methodology is in the process of being evaluated but has not yet been approved.

7.2.9 In kind contributions not used on the premises

Refer to Article 6.4 (*p120 in V4.1 Oct 2017)*, Article 11 (*p136 in V4.1 Oct 2017)* and Article 12 (*p140 in V4.1 Oct 2017*) of the AGA for clarification of costs eligible in this category.

Only enter costs here that have already been included in other cost categories, as this identifies such costs in order that they will be excluded from the calculation of indirect costs.

For example: A university professor spends one day a week on the project working from his office at the university (where the partner is not the university). The professor's time costs are included within the labour costs estimates section and should also be identified in this section.

7.2.10 Financial audit requirement

A financial audit is required on the full project costs, at the end of the project, for any partner that has total direct costs (calculated in column Z) greater than 325 k€. Column AA advises if a financial audit would be required for any individual participant. However for any partner that has a linked third party(s) the total costs

of the partner and third party(s) combined need to be considered. If the combined direct costs exceed 325 k€ then a financial audit would be required of the partner and all its linked third parties.

7.2.11 Indirect cost rates

The eligible indirect rates are automatically applied. These are:

- 5 % for EURAMET NMIs and DIs from countries participating in and contributing to EMPIR (and their Linked Third Parties).
- 25 % (standard H2020 rate) for all other participants.

Indirect costs are automatically calculated and are the product of the indirect cost rate and the total eligible direct costs excluding subcontracting (see 7.2.3) and in-kind resources not used at the premises (see 7.2.9).

(EURAMET notes that the actual indirect costs of partners are likely to be significantly higher in many cases. Such actual indirect costs are not applicable for these projects).

7.2.12 Reimbursement rates and EU contribution

The eligible reimbursement rates are automatically applied. These are:

- 100 % for funded EURAMET NMIs and DIs from countries participating in and contributing to EMPIR (and their Linked Third Parties)
- 100 % (standard H2020 rate) for all External Funded Partners.
- 0 % for Unfunded Partners.

EU contributions are automatically calculated and are the product of the reimbursement rate and the total eligible costs.

7.3 Administrative details

7.3.1 Contact details

This section relates to columns AG-AH of the 'Participant data' worksheet.

For all participants the contact details of a technical and an administrative contact should be given.

Where an administrative contact has been automatically indicated, EURAMET has already been advised of this single common contact for that organisation and will not take account of any alternative contact entered. (Changes to such contacts should be made directly by the organisation to EURAMET, separately from a project proposal). Note that the contact named here is the participant's administrative contact and, for the Coordinating partner, is not necessarily the same as the project administrative contact.

7.3.2 Legal Entity Details

This section relates to columns AI-AN of the 'Participant data' worksheet

All legal entities must be registered in the European Commission's Beneficiary Register and therefore have a Participant Identification Code (PIC)[1]. Submission of a Template 5: Project Administrative Data that does not include a PIC for all participants will not be admissible and will not be evaluated.

The full legal name, legal address, VAT number and National Registration number should be given (if the legal entity does not have a VAT number or National Registration number please state "none" in the appropriate cell). Legal entities known to EURAMET do not need to complete these items and the datasheet will indicate where this is the case.

If there is a possibility that EURAMET may need to validate a legal entity (based upon information in the EURAMET MSU's database at the launch of Stage 2) this is indicated. For these legal entities the email address of the person responsible for legal matters should be given.

If validation is required, following the selection of projects for funding, the MSU will email the legal and administrative contacts in December with a request for information.

[1] http://ec.europa.eu/research/participants/portal/desktop/en/organisations/register.html

7.3.3 Bank details

This section relates to columns AP-AT of the 'Participant data' worksheet

EURAMET require the Bank name, address, account name (i.e. organisation to whom the account is registered, which is often the legal entity name), IBAN and SWIFT of all funded partners (all payments will be in Euro). Please enter the IBAN in the following format (with a space after every 4th digit)

DE19 3003 0880 0430 1910 04

Legal entities whose bank account details are known to EURAMET do not need to complete these items (the datasheet will indicate where this is the case).

7.3.4 External Partners Declaration

This final section relates to column AV of the 'Participant data' worksheet and is required for the external partners.

All External Funded partners must select from one of the following statements, confirming that the partner:

a. is a Legal entity that represents a DI of a EMPIR participating and contributing state *(and is participating in the project outside of the area of designation of the DI)*, or

b. is a legal entity whose viability is guaranteed by an EU Member State or associated country or

c. acknowledges that they will be subject to a financial capacity check by EURAMET and may require a Financial Guarantee before they can receive prefinancing payments

Those organisations selecting c) will be advised during negotiation whether or not a financial guarantee is actually required.

Fees for arranging a guarantee are eligible costs and may be budgeted for (see other costs and services).

8 'WP months data' worksheet

The total months budgeted by each participant is automatically populated from the hours estimated in the 'Participant data' worksheet, calculated at 163 hours per month.

Enter the number of months to be spent on each WP by each participant. Ensure that all the months are allocated, you can do this by checking that the totals agree and that the unallocated amount indicated is zero.

All participants (including Unfunded Partners) should have some resource for management as they all have reporting obligations. EURAMET suggests 0.5 – 1 month per participant. In general participants should also have resource for the impact work package.

9 'A', 'B' and 'C' worksheets

These worksheets are completed automatically as data is entered on the 'Top level data' and 'Participant data' worksheets. Once all the information has been entered into Template 5: Project Administrative Data and checked, the tables on these worksheets should be pasted into Template 4: JRP protocol or Template 7: SIP protocol or Template 11: JNP protocol in the relevant sections.

10 'TP Facilitator' worksheet

The coordinator should copy this data into a separate workbook, in order to provide information to the TP Facilitator whenever requested. EURAMET anticipates that the TP Facilitator will request information on a regular basis during the preparation of a proposal.

11 'Comments' worksheets

Information should be included on the 'Comments' worksheets to explain the basis of the costs for each participant within each cost category. These worksheets are useful for both the coordinator and EURAMET to check that the components of the costs are reasonable, in line with eligibility requirements, and that no significant items have been omitted. Some examples of comments are provided below.

'**Comments – Labour'** worksheet should be used to record information about the number and grades/seniority of staff who are expected to work on the project.

No. Organisation, Country	Labour (Months)	(€)	Comment
1: CCC, United Kingdom	71	407 540	1 principal researcher; 2 senior researchers; 1 PhD student
2: AAA, Germany	17	108 460	1 senior researcher
3: BBB, Czech Republic	6	23 250	1 senior researcher; 1 junior researcher; 1 technician

'Comments – Subcontracts' worksheet should be used to record information about any proposed subcontracts. Please indicate which activities/tasks the subcontracts apply to.

No. Organisation, Country	Subcontracts (€)	Comment
1: CCC, United Kingdom	11 075	Technical support from a specialist company for the development of the e-learning platform in A4.2.3 (€6575); use of a specialist external technical writer for the project newsletters and articles in the popular press in A4.1.5 and A4.1.6 (€4500)
2: AAA, Germany	2 000	Design of project website by a specialist company (€2000)
3: BBB, Czech Republic	3 600	Specialist analysis of biofuels content in A1.3.4 (€3600)

'**Comments – T&S'** worksheet should be used to record information about any travel and subsistence (T&S), including the likely number of people from the organisation who will be attending (if more than one) e.g. T&S to attend a workshop, project meetings, visit to "NMIX" for a week to undertake joint testing, attendance at conferences to present the project. Where possible include a breakdown of the costs. If an organisation funds T&S costs from its overhead then state that "T&S is included in the overhead" and describe the travel that will be undertaken even though no budget will be included in this category for the organisation.

No. Organisation, Country	T&S (€)	Comment
1: CCC, United Kingdom	10 800	5 project meetings, 2 people (€9000); visit to AAA for joint working, 1 person for 1 week (€1800)
2: AAA, Germany	6 844	5 project meetings, 2 people (€5000); 1 conference, 1 person (€1844)
3: BBB, Czech Republic	7 000	5 project meetings, 1 person plus 1 additional person from BBB attending the kick off and final project meeting (€6400); 1 conference, 1 person (€600)

'Comments – Equipment' worksheet should be used to record information about equipment. Where depreciation will be charged details of the utilisation and period of use should be given.

The rationale for the inclusion of any individual items of significant cost should be included.

Where several items of significant cost are budgeted these should be detailed in the comment and costs of each item over €5,000 given

No. Organisation, Country	Equipment (€)	Comment
1: CCC, United Kingdom	52 000	Lease of clean room facilities (€20 000), 4 voltmeters (€8 000 each)
2: AAA, Germany	3 754	Miniature lead lined chamber for offsite testing (€3 754)
3: BBB, Czech Republic	4 500	Depreciation costs of large force machine (20 % utilisation over 24 months) (€4 500)

'Comments – Internally Invoiced Goods and Services' worksheet should be used to record information about Internally Invoiced Goods and Services.

No. Organisation, Country	Internally Invoiced Goods and Services (€)	Comment
1: CCC, United Kingdom	1 500	Self-produced consumables (€750); catering costs for 1 project meeting (€750)
2: AAA, Germany	6 032	Electron microscopy analysis (metallurgical analysis on selected double-walled thermocouples, equipment based on hours of use, covers up to 50 hours) (€6032)
3: BBB, Czech Republic	4 500	Engineering workshop charges for the production of a flange (€500); use of clean room facility based on number of hours of use for assembly of microcomponents (€4000)

'Comments – Other Goods and Services' worksheet should be used to record brief information about any Other Goods and Services.

No. Organisation, Country	Other Goods and Services (€)	Comment
1: CCC, United Kingdom	25 500	Membranes and consumables (€6000); isotopically enriched (Si) inorganic spikes (€4000); cell culture reagents (cell culture media, antibiotics) and consumables (tissue culture flasks) (€9000); reimbursement of invited speakers' T&S for final project workshop (€1500); financial audit (€5000)
2: AAA, Germany	12 625	Reactive dyes (€3825); polystyrene particles (€2000); biological buffers (€500); proteins (€800); logistics and catering costs for hosting one project meeting (€1500); open access publication fees x2 (€2000); costs of making data FAIR (€2000)
3: BBB, Czech Republic	8 500	Registration fees for 1 workshop and 1 conference (€1500); engineering workshop costs for manufacture of stands for test samples (€4000), open access publication fees x1 (€1000)

'Comments – Large Research Infrastructure costs' worksheet should be used to record information about any Large Research Infrastructure costs.

No. Organisation, Country	Large Research Infrastructure (€)	Comment
1: CCC, United Kingdom		
2: AAA, Germany	21 250	The methodology was approved by the European Commission on 23 April 2015 (reference number XXX/201504/23456) The research facility comprises all equipment and research laboratories at the 3 sites in Heidelberg. The research facility includes processing, measurement and chemical laboratories and their analysis and processing equipment, such as laboratory equipment and R2R pilot printing machines and a nanoparticle pilot reactor.
3: BBB, Czech Republic		

EMPIR Call Process
List 5: Checklist for Template 5

Document: P-CLL-LST-104 Version: 1.3
Approved: Programme Manager 2018-06-10

This checklist supplements Guide 5: Submitting administrative data for EMPIR Projects and Template 5: Project Administrative Data. Its purpose is to allow proposers to review their completed Project Administrative Data workbook and check that all necessary information is included prior to submission.

Overall checks	√
Ensure you are using the latest version of Template 5: Project Administrative Data and all worksheets, and yellow, green and blue cells have been completed (as required)	

Top level data	√
All green and yellow cells have been completed on the 'Top Level data' sheet	
Section A, the following information has been included • project short name of less than 13 characters including spaces in the 'Short name proposed' cell • start date, which agrees with the protocol (start date must be the first day of a month) • project duration, which agrees with the protocol (project duration must be an integer number of months)	
Section C related to H2020 objectives has been completed for all 3 statements (climate action, sustainable development and biodiversity)	
Section C '% of the project related to documentary standards' has been completed	
Section D has been completed for SIP and Pre & Co-Normative proposals ONLY	
Section E has been completed and is correct	
Section F has been completed and the statement as to whether the project will 'Opt-in' or 'Opt-out' of Data Management reporting is consistent with section B2e of the protocol	
Section G declarations have NOT been modified or deleted	

Participant data	√
All green, yellow and blue cells have been completed as appropriate	
All project participants have been included in the correct order and under the correct type (Internal Funded Partner, External Funded Partner, Unfunded Partner, Linked Third Party) on the 'Participant data' sheet	
All partners have identified their labour methodology(s) (actual (A), average (B) or rarely SME owners not receiving a salary (C)) and have included the labour costs in the correct column(s) (O, P or J)	
Resources (e.g. labour, T&S, other etc) have been included for all participants including Unfunded Partners	
All costs are listed in the correct cost category	
Legal entity details and contact details for all participants have been included unless auto-populated	
Bank account information has been included for all Internal and External Funded partners unless auto-populated	
Declarations (column AU) have been completed for all External Funded Partners	
No Excel comments are included on the 'Participant data' sheet. Do not include 'n/a' in any of the cells	

WP months data	√
For each participant the months are assigned to the correct WPs	
Totals for each participant agree with the line below the main table and the overall 'unallocated' number is 0.0	

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The EMPIR initiative is co-funded by the European Union's Horizon 2020 research and innovation programme and the EMPIR Participating States

NO lines or columns have been deleted from the WP months datasheet (they can be hidden if required)	

Comments worksheets	√
For each participant with costs (i.e. labour, subcontract, T&S, equipment, other goods and services and infrastructure), the costs must be described in the yellow comments cells (i.e. no blank cells)	
Subcontract costs: For each participant with subcontract costs, the comments must explain what the subcontracts relate to, indicate which activities or tasks the subcontract relates to and provide a breakdown of the subcontracts	
T&S costs: For each participant with T&S costs, the comments must include a breakdown of T&S costs e.g. project meetings, conferences etc and also how many meetings and how many attendees	
Equipment costs: Only the costs for depreciation costs of capital equipment, renting or hiring of facilities or the purchase of equipment which is required solely for the project have been included	
Equipment costs: For each participant with equipment costs, the comments explain what the costs relate to and include a breakdown of how much is allocated to depreciation costs, hire of a facility, purchase of equipment etc. If the costs relate to depreciation then the period over which the equipment will be used (e.g. X months) and its utilisation during that period (e.g. Y %) should be stated.	
Internally Invoiced Goods and Services: Only costs for goods and services which the beneficiary itself will produce or provide are included. Examples for this category are: self-produced consumables (e.g. electronic wafers, chemicals); use of specific research devices or research facilities that are owned by the partner (e.g. clean room, wind tunnel, supercomputer facilities, electronic microscope, beam line, nanofabrication facilities, engineering workshop); hosting services for visiting researchers (e.g. housing, canteen).	
Other goods and services costs: For each participant with other goods and services costs, the comments explain what the costs relate to and include a breakdown of how much is allocated to consumables, conference and workshop registration fees, costs for engineering workshops, open access publication costs, logistics costs for meetings and workshops, financial audit costs etc	
Infrastructure costs: In the rare case where large Infrastructure costs are included for a participant, comments should explain what the costs relate to and whether the methodology has already been approved by the EC	

Guide 6: Evaluating EMPIR Projects

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The EMPIR initiative is co-funded by the European Union's Horizon 2020 research and innovation programme and the EMPIR Participating States

CONTENTS

If you require further help or guidance after reading this document, please contact the helpdesk

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1 Scope

This Guide explains how to evaluate proposals for EMPIR Calls and the responsibilities of the people involved. It does not include:

- Form 6c: JRP Evaluation
- Form 6d: SIP Evaluation
- Form 6f: JNP Evaluation
- information on eligibility, this is described in Guide 1: Admissibility and Eligibility for EMPIR Calls
- information on writing a proposal or resourcing and costing a proposal, this is described in Guide 4: Writing Joint Research Projects (JRPs), Guide 7: Writing Support for Impact Projects (SIPs), Guide 11 Writing Joint Network Projects and Guide 5: Administrative data for EMPIR Projects
- specific details for an EMPIR call (e.g. budget, evaluation weightings and relevant dates) which can be found in the table of Budget and Features for the Call.

2 Background

The European Metrology Programme for Innovation and Research (EMPIR) aims, through European integration, to develop new measurement capabilities that have strategic impact for Europe, with the overall goal of accelerating innovation and competitiveness, generating data and knowledge necessary to improve quality of life, and providing better tools for the scientific community. It is funded by the EMPIR participating states and the EU. The national funding supports the Internal Funded Partners (the EURAMET NMIs and DIs) and they consequently receive a lower EU Contribution than the External Funded Partners. Projects must be coordinated by an Internal Funded Partner.

EURAMET currently issues calls for three types of EMPIR project – Joint Research Projects (JRPs) which are “Research and Innovation Actions” in Horizon 2020 terms, and Joint Network Projects (JNPs) and Support for Impact Projects (SIPs) which are "Coordination and Support Actions". JRPs and JNPs are submitted in response to a Selected Research Topic (SRT) or Selected Network Topic (SNT) published by EURAMET which defines the objectives to be achieved by the proposers. The SRTs and SNTs are generated from information supplied in an earlier stage of the call. SIPs are submitted in response to a Call Scope which will often restrict proposals to actions designed to ensure the outputs of previously completed projects are exploited fully.

3 Referees

EURAMET appoints independent expert referees to assist with the evaluation of proposals for EMPIR calls. Guide 8: Registering as a referee for EMPIR explains how to register as a referee.

EURAMET takes all reasonable steps to ensure that referees are not faced with a conflict of interest between their own research/business interests, and their evaluation activities for EURAMET. All referees must abide by a Code of Conduct and sign Form 6a: Code of Conduct and Declaration prior to beginning any evaluation.

For some types of project, referees must attend a review conference or consensus group for the evaluation of proposals. In this case the EURAMET Management Support Unit (MSU) will liaise with referees in order arrange the administration and logistics.

3.1 Appointment of referees

To evaluate the proposals submitted, EURAMET compiles a pool of appropriate referees and then selects referees from the pool. A proposal will be evaluated by at least three appropriate referees.

When selecting referees EURAMET looks for a high level of skill, experience and knowledge in the relevant areas. Providing this condition can be satisfied, EURAMET then seeks a balance in terms of:

- skills, experience and knowledge
- geographical diversity
- gender

- where appropriate, the private and public sectors and
- an appropriate turnover of referees from year to year

4 Evaluation process

4.1 Evaluation criteria

The three evaluation criteria for proposals are:

1. Excellence
2. Impact
3. The quality and efficiency of the implementation

Form 6c: JRP Evaluation, Form 6d: SIP Evaluation and Form 6f: JNP Evaluation details the aspects to be taken into account for each of the evaluation criteria.

4.2 Prior to evaluation

EURAMET will check the eligibility of each proposal and only eligible proposals are evaluated. Where eligibility is not met the proposal will be withdrawn and the proposers informed. If ineligibility is discovered at a later time during the evaluation process, the proposal will be withdrawn.

Where there is a doubt on the eligibility of a proposal, EURAMET reserves the right to proceed with the evaluation, pending a final decision on eligibility. The fact that a proposal is evaluated in such circumstances does not constitute proof of its eligibility.

4.3 Principles of evaluation

All proposals are evaluated against the evaluation criteria Form 6c: JRP Evaluation, Form 6d: SIP Evaluation and Form 6f: JNP Evaluation. They are evaluated as presented, on their own merit and all proposals are treated equally.

EURAMET takes all reasonable steps to ensure confidentiality of proposals, before, during and after evaluation. Referees are required to maintain the confidentiality of all information contained within the proposals they evaluate, and of the evaluation outcomes.

Any proposal which contravenes fundamental ethical principles or which does not fulfil any conditions set out in the EMPIR call may be excluded from evaluation at any time. In clear-cut cases (e.g. a proposal which does not include the required number of partners), the proposal may be ruled out of scope without referring it to referees.

Due to the limited time EURAMET has between announcing the selection of projects and contract signature, opportunities for negotiation will be limited and

- Referees must evaluate each proposal as submitted and not on its potential if certain changes were to be made
- If referees identify shortcomings (other than minor ones and obvious clerical errors), they must reflect those in a lower mark for the relevant criterion
- Referees only explain the shortcomings, and do not make recommendations i.e. do not suggest additional partners, additional work packages, reduction of resources
- Proposals with significant weaknesses that prevent the project from achieving its objectives or with resources being seriously over-estimated must not receive above-threshold marks

4.4 Operational capacity

Based on the information provided in the proposal, the referees are asked to judge whether each of the partners in the proposal possess the basic operational capacity to carry out the proposed work. If they judge that this is not the case, then they are asked to indicate the partner(s) concerned and provide a short

explanation. In any case they continue to evaluate the full proposal, taking into account all partners and activities.

4.5 Evaluation

4.5.1 Referees' individual preliminary assessment

In order to prepare, a few weeks prior to evaluation, each referee will be emailed by the MSU, links to the proposal(s) to be evaluated and other relevant supporting documents for the EMPIR Call.

Referees must not discuss proposals with proposers or other referees at this time. Instead, using this information referees should:

- Familiarise themselves with the evaluation criteria and read Form 6c: JRP Evaluation, Form 6d: SIP Evaluation and Form 6f: JNP Evaluation as appropriate
- Understand the impact and the implementation requirements of proposals by reading Guide 4: Writing Joint Research Projects (JRPs), Guide 7: Writing Support for Impact Projects (SIPs) and Guide 11 Writing Joint Network Projects as appropriate
- Read all proposals assigned to them and form an initial opinion about each proposal
- Note any key issues, or areas that need clarification or comment, and if attending the review conference, formulate questions that they may wish to ask the consortium representative at the review conference
- Referees can privately mark each proposal against the evaluation criteria given on Form 6c: JRP Evaluation, Form 6d: SIP Evaluation and Form 6f: JNP Evaluation. Then if they are attending the:
    - review conference, referees should note that their opinion is private and only the final consensus mark (agreed by all referees) is collected by EURAMET at the review conference
    - consensus group, referees should email their completed Form 6d: SIP Evaluation to msu@npl.co.uk 2 weeks prior to the consensus group.
- Email the MSU if they discover a conflict of interest, or find that the research is outside of their area of expertise. However, please note that it is beneficial to have some referees with general rather than very specific expertise

There are key sections in proposals where referees will find information most relevant to evaluation:

Section B should give an overview of the proposed research against the three evaluation criteria

Section E should give a description of each participant; in order for referees to complete the operational capacity check for the consortium

However, referees may find the remaining sections of the proposal useful. Referees may also choose to read other proposals (in the TP they are assigned to) for comparison with those assigned to them. If they do, it should be sufficient to read Section B of these proposals.

4.5.2 Review conference

Usually for the evaluation of JRPs and JNPs, referees must attend a review conference. In this case the EURAMET MSU will liaise with referees in order arrange the administration and logistics of the review conference. The review conference includes the following activities (in chronological order):

- Briefings on the evaluation process
- The poster session where referees clarify their understanding of proposals through informal discussions with a consortium representative (around 20 minutes per proposal)
- A private referee group meeting. In this first private meeting referees share their initial opinions and formulate formal questions for each proposal. Usually, one referee (who is a specialist in the proposal topic) will lead the discussions, which last around 15 minutes per proposal
- The formal question and answer session between the referees and the consortium representative

- A private referee group meeting. In this second private meeting referees discuss each proposal. One referee (who is a specialist in the proposal topic) will usually lead the discussions, which last around 30 minutes per proposal. For each proposal:
    - Referees must agree a consensus on the marks and comments for each evaluation criterion and complete one Form 6c: JRP Evaluation or Form 6f: JNP Evaluation in the marking book. Each evaluation criterion will be marked out of 5. The threshold for individual evaluation criteria will be 3 and the overall threshold, applying to the sum of the three individual marks will be 10. If a proposal has scored less than this, it cannot be funded
    - Referees must agree a consensus on whether each of the participants meet the selection criterion related to operational capacity
    - All referees in the group must sign the marking books
- A “draft ranked list” of all proposals is formed based on the referee’s marks and the weightings given in the Budget and Features document. Where two or more proposals receive the same weighted mark, the referees will attempt to separate them in the “draft ranked list” through discussion and a vote
- The referees agree the final “draft ranked list”, which will then be recommended to the EMPIR Committee for confirmation

4.5.3 Consensus group

Usually for the evaluation of SIPs, referees must attend a consensus group meeting. In this case the EURAMET MSU will liaise with referees in order arrange the administration and logistics of the consensus group. The consensus group meeting includes the following activities:

- Briefings on the evaluation process
- A private referee group meeting. In this meeting referees discuss each proposal; usually, one referee (who is a specialist in the proposal topic) will lead the discussions. For each proposal:
    - Referees must agree a consensus on the marks and comments for each evaluation criterion and complete one Form 6d: SIP Evaluation in the marking book. Each evaluation criterion will be marked out of 5. The threshold for individual evaluation criteria will be 3 and the overall threshold, applying to the sum of the three individual marks will be 10. If a proposal has scored less than this, it cannot be funded
    - Referees must agree a consensus on whether each of the participants meet the selection criterion related to operational capacity
    - All referees in the group must sign the marking books
- A “draft ranked list” of all proposals is formed based on the referee’s marks and the weightings given in the Budget and Features document. Where two or more proposals receive the same mark, the referees will attempt to separate them in the “draft ranked list” through discussion and a vote
- The referees agree the final “draft ranked list”, which will then be recommended to the EMPIR Committee for confirmation

4.6 Confirming the ranked list

If the referees decide not to separate any ties around the budget line then the proposals will be separated:

- first by giving more weight to the evaluation criteria with the largest weight for that TP
- then by selecting projects that allow the target external participation for the TP to be met most closely
- and finally, selecting projects that allow the overall target external participation for the programme as a whole to be met most closely

The EMPIR Committee agree which proposals to fund based on the ranked list and recommendations of the referees and the available budget. Generally proposals will be funded in rank order until the available budget is spent but the EMPIR Committee may adjust the distribution of the budget between TPs or decide to leave some budget unallocated.

The selection of proposals to be funded will be formally announced on the date given in the table of Budget and Features for the Call.

5 Marking guidance

One completed Form 6c: JRP Evaluation, Form 6d: SIP Evaluation and Form 6f: JNP Evaluation is required per proposal.

- There are three evaluation criteria for proposals
- Each evaluation criterion will be marked out of 5; half marks may be given
- The threshold for individual evaluation criteria will be 3 and the overall threshold, applying to the sum of the three individual marks will be 10. If a proposal has scored less than this, it cannot be funded.
- In some calls the evaluation criteria may be weighted after marking; this occurs at the decision of the EMPIR Committee as indicated in the table of Budget and Features for the Call
- Consensus comments must be given by the referees to support the marks given and provide feedback to the consortia.

0	**Fail:** the proposal fails to address the criterion or cannot be assessed due to missing or incomplete information (unless the result of an 'obvious clerical error')
1	**Poor:** the criterion is inadequately addressed or there are serious inherent weaknesses
2	**Fair:** the proposal broadly addresses the criterion but there are significant weaknesses
3	**Good:** the proposal addresses the criterion well but with a number of shortcomings
4	**Very Good:** the proposal addresses the criterion very well but with a small number of shortcomings
5	**Excellent:** the proposal successfully addresses all relevant aspects of the criterion; any shortcomings are minor

6 Roles and Responsibilities

6.1 EMPIR Committee Members

The EMPIR Committee members are responsible for implementing EMPIR and the selection of the proposals to be funded taking into account the advice from the referees.

The EMPIR Committee members may NOT attempt to influence the opinion of the referees or express any opinion to the referees on the merits or otherwise of any proposal.

6.2 EMPIR Chair and Deputy EMPIR Chair

The EMPIR Chair and deputy EMPIR Chair are responsible for approving the selection of the referees and the evaluation review procedure.

The EMPIR Chair and deputy EMPIR Chair may not attempt to influence the opinion of the referees or express any opinion to the referees on the merits or otherwise of any proposal.

6.3 Management Support Unit

The EURAMET Management Support Unit (MSU) operates under the guidance of the EMPIR Committee and is responsible for:

- Arranging the administration and logistics of the evaluation of proposals, including the review conference and consensus group meeting(s)
- Checking the admissibility and eligibility of proposals
- Recording the outcome of evaluations
- Dealing with expense claims and the honorarium for referees via Form 6b: Payment to Referees
- Negotiating contracts for successful proposals

MSU staff may act as moderators in discussions at the review conference and consensus group meeting(s). The moderator seeks consensus between the referees, without any prejudice for or against particular proposals or the organisations involved, and may assist with details of the processes involved.

MSU staff will NOT attempt to influence the opinion of the referees and MUST NOT express any opinion on the merits or otherwise of any proposal.

6.4 Referees

Referees are independent experts, acting in a personal capacity, and when performing the evaluation must not represent any organisation, national interest, or other entity. Referees must declare any links to a particular consortium and must sign “Form 6a: Code of Conduct and Declaration” prior to beginning any evaluation. The referees are responsible for:

- Maintaining the confidentiality of the documents they are assessing.
- Evaluating the merits of each application against the given evaluation criteria.
- Reporting results of the evaluation to EURAMET on the relevant forms.
- Deleting or destroying all documents after evaluation.
- Informing EURAMET of any conflict of interest.

6.5 The European Commission’s Independent Observer and Representative

The European Commission may send an ‘Independent Observer’ to the review conference and consensus group meeting(s). He/she does not participate directly in the evaluation procedure. He/she will have access to all areas of the evaluation process, and will report back his/her observations and opinions on the process to the European Commission. The European Commission may also send a representative to the review conference and consensus group meeting(s).

7 Evaluation review procedure

If a proposer considers that the evaluation of their proposal has not been carried out in accordance with the Horizon 2020 rules for Participation, the relevant work plan or the call for proposals, they can request a review. A request for review shall relate to a specific proposal, and shall be submitted by the coordinator of the proposal to msu@npl.co.uk within 30 days of the date on which EURAMET informs the coordinator of the evaluation results.

On receipt of a request for review, EURAMET will form an evaluation review committee composed of the EMPIR Chair or their deputy and two other members of the EMPIR Committee.

The examination shall cover only the procedural aspects of the evaluation, and not the merits of the proposal.

The evaluation review committee shall provide an opinion on the procedural aspects of the evaluation process. The committee may recommend one of the following:

- re-evaluation of the proposal primarily by evaluators not involved in the previous evaluation;
- confirmation of the initial evaluation.

On the basis of this recommendation, a decision shall be taken by EURAMET and notified to the coordinator of the proposal. EURAMET will take such decision without undue delay.

EMPIR Call Process
Form 6c: JRP Evaluation

Date of evaluation		Proposal number	
Is the JRP suitable for funding?		Yes/No	

Does each participant have the necessary basic operational capacity to carry out their proposed activities?	Yes/No
If no, please add comments:	

Conformity with the SRT objectives	**Mark (X) one option only**
Fully conforms and addresses all the objectives	
Partially conforms & any deviation is appropriately justified	
Does not conform, OR any deviation is NOT justified	
If the proposal does not conform with the SRT objectives please add comments:	

	Excellence	**Impact**	**Quality and efficiency of the implementation**	**Total**
Score				
Weighted score				

	ASPECTS TO CONSIDER:	REFEREES COMMENTS:
EXCELLENCE	**To the extent that the proposed work corresponds to the SRT:** o Clarity and pertinence of the objectives o Soundness of the concept, and credibility of the proposed methodology; o Extent that the proposed work is beyond the state of the art, and demonstrates innovation potential (e.g. ground-breaking objectives, novel concepts and approaches, new products, services or business and organisational models); o Appropriate consideration of interdisciplinary approaches and, where relevant, use of stakeholder knowledge.	
IMPACT	**The extent to which the project outputs contribute at the European/International level to:** o The expected impacts listed in the SRT o Enhancing innovation capacity, creating new market opportunities and strengthening the competitiveness and growth of companies o Address issues related to climate change or the environment, or bring other important benefits for society; **The quality of the proposed measures to:** o Exploit and disseminate the project results (including management of IPR), and to manage research data where relevant. o Communicate the project activities to different target audiences o The extent to which relevant stakeholders as identified in the call scope : o have their needs explained and addressed o are actively engaged o are able to access the project´s results **The extent to which relevant stakeholders:** o have their needs explained and addressed o are actively engaged o are able to access the project´s results	
QUALITY AND EFFICIENCY OF THE IMPLEMENTATION	Quality and effectiveness of the proposed work, including extent to which the resources assigned to work packages are in line with their objectives and deliverables; Appropriateness of the management structures and procedures, including risk and innovation management; Complementarity of the participants within the consortium; Appropriateness of the allocation of tasks, ensuring that all participants have a valid role and adequate resources in the project to fulfil that role	

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Document Control Page

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EMPIR Reporting Guidelines
Part 0 – Guide to the parts

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CONTENTS

If you require further help or guidance after reading this document, please contact the helpline

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1 Introduction

The EMPIR Reporting Guidelines are divided into Parts 0 - 9 (see below) and these form the reference documents for reporting for JRPs, SIPs and RMGs in accordance with the relevant clauses of the EMPIR Grant Agreement and EMPIR RMG Contract.

Part 0: Guide to the parts

This guide defines the parts of the EMPIR Reporting Guidelines, provides general guidance about EMPIR reporting, further information on reporting requirements and responsibilities, a reporting timetable, guidance on amendments, a list of reporting templates (Annex A) and guidance on the submission of information to the EURAMET publications repository link (Annex B). In addition to the EMPIR Reporting Guidelines, Reporting Templates are provided to ensure that the reports are comprehensive and presented in a uniform manner.

Part 1: Writing a Publishable Summary

Part 1 provides guidance on how to write a publishable summary. A publishable summary should be prepared as part of interim, periodic and final reporting by Joint Research Projects (JRPs) and Support for Impact Projects (SIPs). Reporting Templates 1 and 2 (for JRPs and SIPs respectively) are linked to this part of the EMPIR Reporting Guidelines.

The publishable summary should be a standalone / self-contained document that can be read and understood without reading any of the previous outputs or documentation from the project. It should be of suitable quality to enable direct publication by EURAMET and the Commission. The publishable summary is an important public document that explains, to a non-specialist audience, the need for the research and why it will be of benefit to society. This audience includes key policy-makers, regulators, industrialists, officials at standards developing organisations and at research funding bodies and the European public. The publishable summary will be publicly available via the EURAMET website and text from the publishable summary will be used by EURAMET to create promotional material (posters and brochures), for promoting EMPIR funded projects, in particular to the European Commission.

Part 2a: Writing a Technical Report (Progress)

Part 2a provides guidance on how to write a technical report (progress). A technical report (progress) should be prepared as part of interim, periodic and final reporting by JRPs and SIPs. Reporting Template 3 is linked to this part of the EMPIR Reporting Guidelines.

In EMPIR, the technical report (progress) is completed in exactly the same way for interim and periodic/final reports. It provides an overview of progress towards the objectives of the project and an explanation of the work carried out, as well as summarising the work done, providing information on deviations from Annex 1 and the consequences and proposed corrective actions, and information on ethical issues.

Part 2b: Completing the Technical Report (Finance)

Part 2b provides guidance for each funded partner and linked third party on how to complete their financial reporting. Additionally it provides guidance for the coordinator on how to compile the summary workbook containing the financial reports of all funded partners.

Part 3: Completing the Output and Impact Report

Part 3 provides guidance on how to complete the output and impact report. An output and impact report should be prepared as part of JRP / SIP interim, and periodic/final reporting. Reporting Template 4 is linked to this part of the EMPIR Reporting Guidelines.

This report provides information on the scientific and dissemination outputs and impacts that the project has delivered including how the knowledge and capabilities produced within the project have been adopted at NMIs/DIs and in the wider user community in Europe and beyond. It should also provide information on exploitable results and how the consortium intends to ensure that they will be exploited to realise impact.

The data in the Output and Impact Report is collated across all EMPIR projects and reported to the Commission at programme level. Therefore the template is a spreadsheet that contains many drop-down menus to

standardise the way much of the information is reported. The drop-down menus must be used. However there are also open fields to enable additional information to be provided.

Part 4: Completing the Questionnaire

Part 4 provides guidance on how to complete the Horizon 2020 questionnaire. A Horizon 2020 questionnaire should be completed as part of periodic reporting by JRPs and SIPs. Reporting Template 7 is linked to this part of the EMPIR Reporting Guidelines.

The Horizon 2020 questionnaire is designed to allow each project to provide the necessary statistical information to EURAMET so that a programme level report can be submitted to the Commission as part of programme level reporting requirements.

Part 5: Submitting Deliverables and Ethics reports

Part 5 provides guidance for the submission of the deliverables and ethics reports produced by JRPs and SIPs. No Reporting Templates are linked to this part of the EMPIR Reporting Guidelines.

Deliverables – the coordinator should send the JRP or SIP's deliverables to EURAMET by the delivery dates stated in the Annex 1 to the EMPIR Grant Agreement.

Ethics reports – when requested in the Annex 1 to the EMPIR Grant Agreement, the coordinator should send a report to EURAMET addressing the specified ethical issues.

Part 6: Preparing for Mid-Term Reviews

Part 6 provides guidance on how JRP representatives should prepare for mid-term reviews. Reporting Template 5 is linked to this part of the EMPIR Reporting Guidelines.

A mid-term review meeting is held for JRPs (not for SIPs) to supplement the documentary based reviews. All of the JRPs will be reviewed at a high level by a group of external expert reviewers. JRP representatives will be informed about requirements and about the date, location and format of the mid-term review meeting by EURAMET in due time. The external expert reviewers will suggest improvements that should be made to the projects.

Part 7: Writing a Final Publishable Report

Part 7 provides guidance on how to write a final JRP / SIP publishable report. Reporting Template 6 is linked to this part of the EMPIR Reporting Guidelines.

The final publishable report is a comprehensive public document that explains the purpose, results and impact of the project to a non-technical audience. It is similar in structure to the publishable summary; the main difference is that there is a much longer section to describe the scientific and technical activities and outputs/conclusions. The final publishable report is targeted at a more technically literate audience within the business, policy-making and standards communities than the publishable summary. It is for people who seek to understand the project in greater depth, understand its relevance to their work and who might as a result go on to read the project's other publications and outputs.

Part 8: Writing a Final RMG report

Part 8 provides guidance on how to write a final Researcher Mobility Grant (RMG) report which is to be completed by an RMG researcher at the end of their grant. Reporting Template 8 is linked to this part of the EMPIR Reporting Guidelines.

Final RMG reports provide a summary of the work undertaken and a description of progress towards completing each task. The RMG Researcher will also contribute to the linked JRP's output and impact report by providing the necessary information to the coordinator at the end of the RMG. In all other aspects, final RMG reporting is a separate activity from JRP reporting.

Part 9: Preparing Data Management Plans (DMP)

Part 9 provides guidance on how to prepare data management plans (DMP). For those Joint Research Projects (JRPs) and Support for Impact Projects (SIPs) that "opted in" a DMP should be prepared at the outset of the project and as part of interim (if necessary), periodic (if necessary) and final reporting. Reporting Template 9 is linked to this part of the EMPIR Reporting Guidelines.

The overall purpose of a DMP is to make research data Findable, Accessible, Interoperable and Reusable (FAIR) in order to ensure that it is soundly managed. It will describe the data management plans for all of the data sets that will be collected, processed or generated by a project, and it must cover the following aspects: the handling of research data during and after the end of the project; specification of the data that will be collected, processed or generated; the methodology and standards that will be applied; plans for data curation and preservation (including after the project).

2 General guidance

Reporting serves a number of functions, specifically:

- Providing the coordinator with the information necessary to manage the project.
- Enabling the coordinator to make a formal declaration regarding JRP / SIP progress.
- Allowing EURAMET to monitor progress of the JRP / SIP / RMG against its stated objectives.
- Providing specific information related to dissemination, knowledge transfer, impact and exploitation of the research to EURAMET for promotion of EMPIR as a whole.
- Providing the information needed to establish the appropriateness of the claimed costs for each individual partner.
- Enabling EURAMET to meet its programme level reporting obligations.

The approval of the reports by EURAMET is a prerequisite for the periodic and final payments to the JRP/SIP partners and RMG researchers by EURAMET. Payments will only be made after EURAMET's approval of the reports. Delays in submission of acceptable reports by individual partners or organisations will result in delays in payment for all JRP / SIP partners.

Coordinators are responsible for compiling reports in cooperation with the partners and RMG Beneficiaries and making a high-level assessment of progress towards the objectives of the project. Coordinators are responsible for the delivery of the reports to EURAMET. Coordinators can only meet their obligations if the other partners in their consortia fully discharge their reporting responsibilities.

The reports explain the work carried out in relation to the objectives and the deliverables of the original work plan, discussing issues encountered, and the solutions found. If any deviations from the work plan and schedule of deliverables have occurred or are expected to occur in the next period, these shall be explained in the relevant report.

EURAMET recommends that the coordinators of JRPs / SIPs inform their partners and RMG researcher(s) at an early stage about the contents and deadlines of the required reports and that they set clear assignments and responsibilities taking account of:

- What information has to be passed within the consortium for each partner and RMG researcher to fulfil his/her obligations.
- The overall timescale for the generation of the various reports.
- The time taken to prepare a financial statement and, where applicable, to obtain the certificate on the financial statement.

As per Article 20.8 of the EMPIR Grant Agreement, if the coordinator of a JRP or a SIP breaches its obligation to submit the reports and if it fails to comply with this obligation within 30 days following a written reminder sent by EURAMET the Agreement may be terminated.

The partners, the work package leaders and/or task leaders as well as RMG researchers as appropriate, shall provide all required information to the coordinator of the JRP / SIP, and support the coordinator in drafting/writing the reports. Please ensure that any acronyms used in reports are clearly explained.

Every report submitted to EURAMET shall indicate the confidentiality status on the front cover, using the classification below:

PU = Public

PP = Restricted to other Horizon 2020 Programme participants (including EURAMET and the European Commission Services)

RE = Restricted to a group specified by the consortium (including EURAMET and the European Commission Services)

CO = Confidential, only for members of the consortium (including EURAMET and the European Commission Services)

Technical reports (progress), Data Management Plans and RMG reports shall bear the classification 'Confidential', financial reports will automatically be assumed to be 'Confidential'.

All reports submitted shall be in English and shall be of sufficient quality to enable a meaningful review. Additionally, reports intended for publication shall be of suitable quality to enable direct publication without additional editing. By submitting the publishable reports to EURAMET, the partners (and RMG Researcher(s) as appropriate) are also certifying that they include no confidential material.

A summary of the reports to be provided in each period is detailed in Sections 5 - 6 below.

Electronic reports/documents should be emailed to EURAMET at msu@npl.co.uk, whilst hard copies of documents (where requested – see Sections 5 - 6) should be sent to the EURAMET-MSU Finance Officer, EURAMET-MSU, National Physical Laboratory, Hampton Road, Teddington, Middlesex, UK, TW11 0LW.

If you wish to submit a report or deliverable confidentially (eg encrypted) to EURAMET then please telephone the MSU helpline, or your EURAMET Project Officer, on +44 20 8943 6666 to discuss an appropriate method.

Submission by the consortium

Except where identified below, the consortium shall transmit the reports through the coordinator to EURAMET electronically as excel or word files or hard copies (according to specified requirements).

Submission by the participating organisations

All inputs to reporting from participating organisations should be submitted to the coordinator using the format agreed with the coordinator.

3 Reporting requirements

3.1 Interim reporting

Interim reporting is not required for JRPs / SIPs of less than 25 months duration.

For JRPs / SIPs of greater than 24 months duration, the consortium shall provide Interim reports summarising progress in the periods specified in Annex 1 of the Grant Agreement. **Each Interim report shall be provided to EURAMET within 45 days of the end of the period.** Interim reporting gives the consortium the opportunity for a brief review of progress specifically indicating whether the JRP / SIP is on target, identifying any issues, consequences and remedial actions.

Interim reporting comprises:

- Publishable Summary (Reporting Templates 1 or 2) - see EMPIR Reporting Guidelines Part 1
- Technical Report (Progress) (Reporting Template 3) - see EMPIR Reporting Guidelines Part 2a
- Output and Impact Report (Reporting Template 4) - see EMPIR Reporting Guidelines Part 3
- Data Management Plan (Reporting Template 9) – See EMPIR Reporting Guidelines Part 9

3.2 Periodic reporting

Each project must prepare two periodic reports: the first as close as possible to the mid-term and the second at the end of the project. The periods are specified in Annex 1 of the Grant Agreement. **Periodic reports shall be provided to EURAMET within 60 days of the end of the period.** Periodic reporting provides a review of progress specifically indicating whether the JRP / SIP is on target, analysing financial activity to date, identifying any issues, consequences and remedial actions required. Downloadable Reporting Templates are available for these reports.

Periodic reporting comprises:

- Publishable Summary (Reporting Templates 1 or 2) - see EMPIR Reporting Guidelines Part 1
- Technical Report (Progress) (Reporting Template 3) - see EMPIR Reporting Guidelines Part 2a
- Technical Report (Financial) (Reporting Templates 20, 21, 30, 31) - see EMPIR Reporting Guidelines Part 2b
- Output and Impact Report (Reporting Template 4) - see EMPIR Reporting Guidelines Part 3

- Horizon 2020 Questionnaire (Reporting Template 7) - see EMPIR Reporting Guidelines Part 4
- Data Management Plan (Reporting Template 9) – See EMPIR Reporting Guidelines Part 9

3.3 Final publishable report

At the end of a JRP or SIP, in addition to the second periodic report, the consortium shall provide a final publishable report, covering the whole project, within 60 days of the end of the project. See EMPIR Reporting Guidelines Part 7 and Reporting Template 6.

3.4 Other reporting

Other reporting includes:

- Completed Deliverables - see EMPIR Reporting Guidelines Part 5
- An Ethics Report (if required in Annex 1) - see EMPIR Reporting Guidelines Part 5
- Final RMG Report(s) (as required in any EMPIR RMG Contract) (Reporting Template 8) - see EMPIR Reporting Guidelines Part 8

4 Requests for amendments or suspension arising outside the reporting activities

Requests for amendments to the EMPIR Grant Agreement and/or suspension to the JRP or SIP (or to the EMPIR RMG Contract) should be made in accordance with Article 55 'Amendments to the Agreement' and Chapter 6 Section 3 'Suspension and Termination' of the EMPIR Grant Agreement, or the relevant articles of the EMPIR RMG Contract.

Requests for changes might include:

- Revised delivery / end dates, particularly those that change periods and/or require re-planning of labour and budgets or redistribution of activities between partners in the case of the JRP or SIP.
- Optimising work plans and therefore redefining activities / deliverables, whilst retaining JRP, SIP or RMG targets.
- Modifying the target of activities / deliverables due to technical challenges or external factors.
- Modifications to the consortium or RMG researcher.

4.1 Amendment to the JRP or SIP protocol or RMG research schedule

If any changes are needed to the implementation of the JRP, SIP or RMG (eg deliverables, research plan, coordinator etc.), the changes must be approved by EURAMET in advance and in writing. Please contact EURAMET in writing as soon as possible once the need for change is identified to gain approval before implementation.

4.2 Amendment to the budget

If a significant change in the budget distribution between partners is needed, the relevant partner(s) should contact EURAMET through the coordinator and submit a request in good time before the change is needed. Please note that it is rare for additional funding to be available for a JRP or SIP.

5 Reporting timetable

Timeline		Report	Prepared by	Submitted by/to
Project start	+ one month	**Publishable Summary for JRPs (Template 1)** **Publishable Summary for SIPs (Template 2)** **Data Management Plan (Template 9)**	Coordinator	Coordinator to EURAMET
Interim 1 *(if required)*	+ 45 days	Partner input to Interim Report	Partners	Partners to coordinator
Interim 1 *(if required)*		**Publishable Summary for JRPs (Template 1)** **Publishable Summary for SIPs (Template 2)** **Technical Report (Progress) (Template 3)** **Output and Impact Report (Template 4)** **Data Management Plan (Template 9)**	Coordinator	Coordinator to EURAMET
Mid-term periodic	+ 60 days	Partner input to Periodic report	Partners	Partners to coordinator
Mid-term periodic	as agreed with coordinator	Resource and Cost report (Template 20 for partners and for linked third parties)	Funded partners and linked third parties	Partners/ linked third parties to coordinator
Mid-term periodic	as agreed with coordinator	Original signed Financial Statements (Template 20 for partners and for linked third parties)	Funded partners and linked third parties	Partners/ linked third parties to coordinator
Mid-term periodic	as agreed with coordinator	Original signed Certificate on the Financial Statements (Template 30 i.e. the standard Horizon 2020 template)	Funded partners and linked third parties Only if total cumulative project costs (excluding overheads) exceed 325 k€	Partners/ linked third parties to coordinator
Mid-term periodic		**Publishable Summary for JRPs (Template 1)** **Publishable Summary for SIPs (Template 2)** **Technical Report (Progress) (Template 3)** **Output and Impact Report (Template 4)** **Horizon 2020 Questionnaire (Template 7)** **Data Management Plan (Template 9)** **Complete set of Financial Statements (Template 20 for partners and for linked third parties)** **Project Financial Report (Template 21)**	Coordinator	Coordinator to EURAMET

Timeline		Report	Prepared by	Submitted by/to
		Certificates on the Financial Statements of all partners that require one (Template 30)		
Interim 2 *(if required)*		Partner input to Interim report	Partners	Partners to coordinator
Interim 2 *(if required)*	+ 45 days	**Publishable Summary for JRPs (Template 1)** **Publishable Summary for SIPs (Template 2)** **Technical Report (Progress) (Template 3)** **Output and Impact Report (Template 4)** **Data Management Plan (Template 9)**	Coordinator	Coordinator to EURAMET
Final / periodic		Partner input to Final / Periodic report	Partners	Partners to coordinator
Final / periodic	as agreed with coordinator	Resource and Cost report (Template 20 for partners and for linked third parties)	Funded partners and linked third parties	Partners/ linked third parties to coordinator
Final / periodic	as agreed with coordinator	Original signed Financial Statements (Template 20 for partners and for linked third parties)	Funded partners and linked third parties	Partners/ linked third parties to coordinator
Final / periodic	as agreed with coordinator	Original signed Certificate on the Financial Statements (Template 30 i.e. the standard Horizon 2020 template)	Funded partners and linked third parties Only if total cumulative project costs (excluding overheads) exceed 325 k€	Partners/ linked third parties to coordinator
Final / periodic	+ 60 days	**Publishable Summary for JRPs (Template 1)** **Publishable Summary for SIPs (Template 2)** **Technical Report (Progress) (Template 3)** **Output and Impact Report (Template 4)** **Final Publishable Report (Template 6)** **Horizon 2020 Questionnaire (Template 7)** **Data Management Plan (Template 9)** **Complete set of Financial Statements (Template 20 for partners and for linked third parties)** **Project Financial Report (Template 21)** **Certificates on the Financial Statements of all partners that require one (Template 30)**	Coordinator	Coordinator to EURAMET
Final	+ 30 days	Final RMG Report (Template 8)	RMG Researcher	RMG Researcher to coordinator and coordinator to EURAMET

All RMG reports must be delivered to EURAMET by the coordinator 30-days after the end of the RMG reporting period (please note that the majority of RMG reports will not align with the due dates of JRP reports). The RMG researcher will only contribute to the JRP Output and Impact Report by providing the necessary information to the coordinator at the end of the RMG. In all other aspects, RMG reporting is a separate activity from JRP reporting.

6 Reporting responsibilities

WHO	WHAT	WHEN	HOW
By each partner, including coordinator and by each linked third party:	Output and Impact Report (Template 4) (JRPs incorporate RMG Final Output & Impact Reports as required)	Interim: + 45 days after end of period *(if required)* Mid-term/Final Periodic: + 60 days after end of period	Electronically (excel) Submit to coordinator
	Horizon 2020 Questionnaire (Template 7)	Mid-term/Final Periodic: + 60 days after end of period	Electronically (excel) Submit to coordinator
	Data Management Plan (Template 9)	Initial: + 1 month from signature of the EMPIR Grant Agreement Interim: + 45 days after end of period *(if required)* Mid-term *(if required)* /Final Periodic: + 60 days after end of period	Electronically (word) Submit to coordinator
	Resource and Cost report (Template 20 for partners and for linked third parties)	Mid-term/Final Periodic: deadline to be agreed with coordinator	Electronically (excel) Submit to coordinator
	Original signed Financial Statement (Template 20 for partners and for linked third parties) Original signed Certificates on the Financial Statements of all partners that require one (Template 30)	Mid-term/Final Periodic: deadline to be agreed with coordinator Mid-term/Final Periodic: + 60 days after end of period	Signed hard copy submitted to coordinator Complete set of signed hard copies
By coordinator:	Publishable Summary for JRPs (Template 1) Publishable Summary for SIPs (Template 2)	Initial: + 1 month from signature of the EMPIR Grant Agreement Interim: + 45 days after end of period *(if required)* Mid-term/Final Periodic: + 60 days after end of period	Electronically (word)
	Technical Report (Progress) (Template 3)	Interim: + 45 days after end of period *(if required)* Mid-term/Final Periodic: + 60 days after end of period	Electronically (word)
	Output and Impact Report (Template 4)	Interim: + 45 days after end of period *(if required)* Mid-term/Final Periodic: + 60 days after end of period	Electronically (excel)
	JRP Self-Assessment for the Mid-Term TP review (JRPs only) (Template 5)	Mid-term Periodic: as requested by EURAMET	Electronically (word)
	Final Publishable Report (Template 6)	Final Periodic: + 60 days after end of period	Electronically (word)
	Horizon 2020 Questionnaire (Template 7)	Mid-term/Final Periodic: + 60 days after end of period	Electronically (excel)
	Data Management Plan (Template 9)	Initial: + 1 month from signature of the EMPIR Grant Agreement Interim: + 45 days after end of period *(if required)* Mid-term *(if required)* /Final Periodic: + 60 days after end of period	Electronically (word)
	Project Financial Report (Template 21)	Mid-term/Final Periodic: + 60 days after end of period	Electronically (excel)

WHO	WHAT	WHEN	HOW
By RMG Researcher:	Final RMG Report (Template 8)	At the end of the RMG	Electronically as required by coordinator. Also a word copy to MSU
RMG Employing Organisation	RMG reporting obligations (incorporated in the RMG Payment Request form)	The RMG Payment Request form will be sent to the Employing Organisation by the MSU. This should be completed by the Employing Organisation and returned to the MSU before the next advance payment is due	Electronically

7 Annexes

7.1 Annex A: List of EMPIR Reporting Templates

The following Reporting Templates should be downloaded from: http://msu.euramet.org/downloads/

7.1.1 Reporting Templates

Template 1	Publishable Summary for JRPs
Template 2	Publishable Summary for SIPs
Template 3	Technical Report (Progress)
Template 4	Output and Impact Report
Template 5	JRP Self-Assessment for the Mid-Term Review
Template 6	Final Publishable Report
Template 7	Horizon 2020 Questionnaire
Template 8	Final RMG Report
Template 9	Data Management Plan
Template 20	Resource and Cost Report (partners and linked third parties)
Template 21	Project Financial Report (coordinators)
Template 30	Certificate on the financial statements*
Template 31	Certificate on the methodology*

* - these are standard H2020 templates.

EURAMET does not provide templates for deliverables or ethics reports (see EMPIR Reporting Guidelines Part 5 for further details).

7.2 Annex B: Submission of documents to the EURAMET Publications Repository Link

Each partner must ensure open access (free of charge, online access for any user) to all peer-reviewed scientific publications relating to its results and also to all relevant data if your project has “opted in” to having a data management plan in accordance with Article 29 of the EMPIR Grant Agreement.

Coordinators should directly submit information to the EURAMET Publications Repository link by completing the online form: https://msu.euramet.org/cgi-bin/be-submit.pl