EMPIR Reporting Guidelines

Part 6 – Preparing for Mid-Term Reviews

EURAMET MSU, Hampton Road, Teddington, Middlesex, TW11 0LW, UK
Phone: +44 20 8943 6666 Email: msu@npl.co.uk
msu.euramet.org

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 helpline

Email: msu@npl.co.uk

Telephone: +44 20 8943 6666

1 Background

All JRPs (but not SIPs) are subject to a mid-term review[1] process to supplement the previous documentary based reviews. For each TP, all the JRPs will be reviewed at a high level by a group of external experts who will be selected by the TP Guardians and by members of the EMPIR Committee.

The reviewers will evaluate the potential outcomes of the projects and their uptake by stakeholders by addressing the following questions:

- Is the project going to meet the needs of the stakeholders?
- How have the stakeholders' needs changed in the 3 years since the PRTs were submitted?
- Is the project closing the capability gap between established and emerging partners? (*TP RPT projects only*)
- Should changes be made to the project to ensure impact is maximised?

The reviews can then be aggregated at TP level to make a judgement on how well the portfolio of projects will meet the intentions in the scope for the call. The mid-term TP reviews will not be about individual project progress against the plan as this is already assessed by the EURAMET MSU during the reporting process.

In order to facilitate the mid-term TP review process, the consortia will need to deliver the documents detailed below according to the relevant TP:

Projects from TP HLT, TP SIB, TP ENG, TP ENV, TP IND, TP FUN and TP RPT

- Publishable Summary
- Reporting Template 5 - JRP Self-Assessment for the Mid-Term Review[2]
- Presentation

Projects from TP NRM

- Publishable Summary
- Reporting Template 5 - JRP Self-Assessment for the Mid-Term Review[2]
- Letter from the chief stakeholder (e.g. main standardisation body) describing the contribution of the project thus far

These documents will be requested by the EURAMET MSU and will then be provided to the reviewers. **Note that it is particularly important that the JRP website is updated prior to the mid-term review as the reviewers will use this as evidence of publications and other dissemination activities.**

A mid-term review meeting will be held for every TP to supplement the mid-term review documents. **The review of the TP NRM projects does not involve a presentation on the project, therefore the TP NRM representatives may choose to attend the meeting via video-conference. Representatives from all of the other TPs are required to attend the meeting in person.**

JRP representatives will be informed about the date, location and format of the mid-term review meeting by the EURAMET MSU. Attendees will include the external experts (~5), the JRP representatives (one per project), the EURAMET MSU and may include the TP Guardian. Guests from the senior management of nearby NMI/DIs hosting the meeting can attend the initial presentations to obtain a wider view of the projects beyond the involvement of their own staff. The mid-term review meeting will include presentations by each JRP representative (where applicable) and a Q&A session. A structure for the presentation is given in Section 3. JRP representatives that are required to give a presentation should follow this structure as closely as possible in their presentations.

The reviewers will express their opinion about the achievements of each project and will make recommendations in their final written report on the improvements that should be made by the project.

[1] Note that JRPs of shorter duration, e.g. 24 months, will be reviewed at the same time as the other JRPs in the TP so the review will be near the end of the shorter projects rather than at their mid-term.

[2] https://msu.euramet.org/downloads/#reporting

Following on from the outcomes of the mid-term review, the EMPIR Committee will decide whether the recommendations should be followed-up by the EURAMET MSU through the normal reporting process or whether the TP Guardian should also be involved. When a suitable solution is agreed (e.g. stop a work package, redefine or refocus activities / deliverables, removal / addition of a partner) the JRP coordinator may need to liaise with EURAMET in order to implement an amendment of the EMPIR Grant Agreement. It is also possible that the EMPIR Committee will raise other general issues about the TP to be addressed by the TP Guardians.

	TP Guardian	**TP Facilitator**
16ENG	Richard Brown (NPL)	Silvie Hoffmanová (EURAMET)
16ENV	Jörn Stenger (PTB)	Béatrice Lalere (LNE)
16NRM	Maguelonne Chambon (LNE)	Eveline Domini (LNE)
16RPT	Miruna Dobre (SMD)	Tanasko Tasic (EURAMET)
17FUN	vacant	Helen Margolis (NPL)
17IND	Jiri Tesar (CMI)	Dolores del Campo (CEM)
17NRM	Maguelonne Chambon (LNE)	Eveline Domini (LNE)
17RPT	Miruna Dobre (SMD)	Tanasko Tasic (EURAMET)

2 The self-assessment

The EURAMET MSU provides a template - Reporting Template 5 - JRP Self-Assessment for the Mid-Term Review, which shall be completed according to your consortium's assessment of the project and sent to the EURAMET MSU to be provided to the external experts before the review meeting.

Please note that the reviewers do not have the Annex 1 of your project, so the self-assessment should be a stand-alone document.

2.1 Introduction

What are the key existing capabilities and knowledge of your consortium?

How will these key existing capabilities and knowledge be enhanced by this project?

How are you narrowing the capability gap between partners and the wider European NMI/DI community? *(TP RPT projects only)*

What will these enhancements enable your partners to do in the future in terms of new products or services to their customers?

What will your project's tangible contribution be to the work of standardisation committees? (*This is particularly important for TP NRM projects*)

Please complete the 'Introduction' as shown in the example below:

Example

1 Introduction

The partners bring together some of the best national measurement capabilities in the world in the area of high-frequency electronic/electromagnetic measurement and two commercial organisations. Some of these capabilities (partner A and partner B) cover very broad areas of the technology and have they been built up over many years. Partner C and partner D have also been involved in this area for many years, but provide a narrower scope to the capability. The capabilities of partner E and partner F are relatively new but they have improved considerably in a relatively short period due to good engagement and knowledge transfer from established partners. The knowledge and expertise of the consortium is at a very high level, particularly amongst the NMI partners that have worked in this area for a long period. However, the emerging organisations, partner E and partner F, are progressing considerably to establish traceability for multi-port measurements and electronic calibration units and by the end of the project will participate in a BIPM Key Comparison.

All partners are increasing their appreciation of the issues affecting this area of metrology and are developing a deeper insight into each other's knowledge and capabilities. All organisations are getting a stronger feel for how difficult it is to apply leading edge metrology research in an industrial environment and how the different research strengths of the consortium can be combined to deliver solutions.

The enhancements to these capabilities, brought about by the work undertaken in this project, are enabling the NMI partners to establish and provide traceability in new areas of measurement (i.e. for new measurands and existing measurands being provided over extended frequency ranges). In addition, new forms of traceability are being made available using the very latest technologies. These enhancements are also opening up new opportunities for further collaboration with the wider scientific community through research programmes such as Horizon 2020.

2.2 Strengths and weaknesses

2.2.1 Objective indicators

The objective indicators are already detailed in your publishable summary or output and impact report, and in your project's Annex 1. Insert the numbers in the table and assess your position in these areas relative to other JRPs in the TP.

2.2.2 Excellence

With a view towards the end of your project, what do you consider are the strengths and weaknesses regarding the scientific or technological excellence of your project's work?

Focus on 3 strengths and 2 weaknesses and compare your consortium's contribution with that from other regions (SIM, APMP, etc.).

Please rate your project using the following scale and explain your self-assessment.

(9) Dominant: The consortium is recognised internationally - setting the pace and direction of metrology in this area worldwide.

(8) Strong/dominant

(7) Strong: The consortium is recognised internationally - not the leading entity, but able to set new directions on its own.

(6) Favourable/strong

(5) Favourable: The consortium operates mostly as its individual national identities - leading at national level and able to sustain technological competitiveness.

(4) Tenable/favourable

(3) Tenable: The consortium operates only as its individual national identities - not leading and unable to set an independent course.

(2) Weak/tenable

(1) Weak: The consortium is unknown beyond Europe and its scientific contributions lag behind other regions.

2.2.3 Impact

Elaborate which, and how, the organisations (partners, stakeholders) will profit from the project outputs.

Describe how your project is engaging with stakeholders to facilitate the transfer of project outputs to those organisations and how this will maximise the early impact of your project.

Indicate the impacts that you expect to be achieved by the project. Take a perspective of 5 years after the end of the project and focus on a maximum of 5 impacts.

Please rate your project using the following scale and explain your self-assessment.

(4) High: Evidence for economic and societal impact, showing important influence on economic growth, environmental issues, public health, healthcare, or health policy.

(3) Substantial: Evidence for economic and societal impact, as a pronounced result of the research.

(2) Moderate: Evidence for economic and societal impact, but this is not a pronounced result of the research.

(1) Weak: No or unclear evidence of economic or societal impact.

Using the standards table from section B2.c of your Annex 1 as a starting point, describe the progress and the status of your main contribution to the work within standardisation bodies e.g. working draft in preparation, technical recommendation submitted, standard in revision, new guides, new work item accepted. In addition, summarise the work that has been done to promote the uptake of the outputs by these bodies e.g. presentations at committee meetings. (*This is particularly important for TP NRM projects, which aim to develop metrological methods and techniques required for standardisation*).

TP RPT projects only

Provide information that demonstrates the narrowing of the capability gap between your consortium and other NMIs/DIs in Europe.

2.2.4 Implementation

Strengths and Weaknesses

Outline the strengths and weaknesses of your consortium in implementing the project's tasks and in achieving the envisaged outputs.

Specify strengths or weaknesses of distinct partners (e.g. in terms of scientific/technological capabilities, motivation and ambition, project management experience, or leveraging the potential impact, etc.).

Issues and deviations

Summarise (in one or two paragraphs) the deviations from your initial project plan and elaborate on the issues and corrective actions which you consider will be necessary for the remaining project duration.

Cooperation and joint research

Is the cooperation between the partners effective and up to the standards required for a successful project? Highlight any partners whose contribution is not as required.

Describe if the joint research is leading to results that individual NMI's could not achieve by themselves. Also describe how this is leading to added value for the metrology and wider communities.

Please complete the 'Strengths and Weaknesses' as shown in the example below.

Example

2 Strengths and Weaknesses

2.1 Objective indicators

Indicator		Total	Target[1]	Poor	Unsatisfactory	Satisfactory	Good	Excellent
Engagement outside the metrology community	Number of external partners	4	4				√	
	Number of unfunded partners	2	2				√	
	Number of collaborators[2]	13	n/a					√
Presentations & other dissemination	Conference presentations /posters	26	12					√
	Other dissemination activities	4	3			√		
Open access peer-reviewed publications[3]	Open access peer-reviewed publications	3	10			√		
	Co-authored open access peer-reviewed publications[4] (of the above)	0	10		√			
	Open access datasets linked to publications	3	n/a			√		
Standards	Inputs to standardisation committees[5]	9	6					√
	No. of unique standardisation committees engaged with (of the above)	7	5					√
Training	Training activities (internal)	4	5				√	
	Training activities (external)	1	3			√		
IP	Patent applications	0	1			√		
Uptake	Uptake/use of project outputs by the end-users	2	n/a				√	

[1]-Target number of specific indicators for the lifetime of the project e.g. open access peer-reviewed papers or conference presentations etc, as described in your Annex 1.
[2] - Collaborators are those organisations that have signed a Letter of Agreement with the consortium.
[3] - Only open access peer-reviewed publications with a suitable persistent identifier should be listed i.e. papers in preparation or submitted should not be included in the table, but can be mentioned in a footnote below the table.
[4] - More than 1 partner from organisations in different countries.
[5] - Committees whose main task is to draft documentary standards – not metrology committees.

2.2 Excellence

The main strengths regarding the scientific and technological excellence of this project are the skills, experience and expertise of the scientists, at the NMIs and unfunded partners. The combined resources of the consortium provide a best-in-the-world knowledge base and this is being exploited in the project to deliver work of a very high standard. In addition, the consortium is working towards the early uptake of the project outputs by the end-users.

Weaknesses within the consortium are the lack of expertise of the smaller NMIs and a few technical delays encountered by these partners, which resulted from equipment and personnel issues.

Strength 1: Knowledge and expertise among the consortium scientists in the topic area of this project

It is considered that the knowledge and expertise within this consortium as a whole exceeds that of any related consortium/activity in other regions.

Strength 2: Combined facilities and resources available at the consortium sites

It is considered that the combined facilities and resources available at the consortium facilities are only rivalled, in one or two areas, by facilities available at NIST, USA. For all other areas of the project, the combined consortium facilities exceed facilities found in other regions.

Strength 3: Science deliverables which work for the customer, not just the NMI

Some of the project's scientific activities are designed for immediate non-NMI use and are being demonstrated outside the NMI community. A measurement method and a residual error model are already in use by one stakeholder.

Weakness 1: Lack of experience within some consortium NMIs

Although two of the partners lack the experience of other partners, such a situation is very common in other regions (e.g. APMP). This apparent 'weakness' is therefore considered not to be any greater than that found in other regions.

Weakness 2: Overcoming delays

Some deliverables have encountered delays due to technical and/or personnel problems, but these have been or are being solved. A key member of the staff has left partner E and the organisation had to appoint a replacement, which led to a delay in the layout design for reference PCBs. Technical issues with the 4-port VNA led to a delay in the multi-port measurements. The issue has been discussed at the project meeting and partner C invited partner E to receive training and carry out the measurements using partner C's equipment at their facilities.

Based on the above indicators, the overall self-assessment rating for this JRP is given as **(8) Strong/dominant**. The consortium is dominated by two larger NMIs (partner A and partner B); if the consortium was more evenly matched it could be ranked higher, however the relative lack of experience of some partners make this difficult to achieve.

2.3 Impact

All partners are benefiting from the project outputs. The participating NMIs are increasing both their measurement service capability (for third-party customer calibration services) and their ability to contribute as collaborators in other research programmes (such as Horizon 2020). In addition, the unfunded partners (commercial organisations) are benefiting through quick and easy access to the knowledge generated by the JRP outputs. The external stakeholder community (European industry and research organisations, such as universities) are also benefiting from the JRP outputs – easily accessible traceability mechanisms enable efficient and reliable testing of new products (in industry) and research into new areas of science and technology (in academia).

The project has established a Stakeholder Advisory Group which progressively gives feedback on the relevance of the different methods developed during the lifetime of the project to create the highest possible impact. The outputs of the project have been disseminated to European manufacturers of VNAs, calibration kits, precision connectors and waveguide components via presentations given at relevant conferences and meetings arranged at the stakeholders' facilities. Two of the project outputs (a measurement method and a residual error model) are already in use by one European stakeholder.

Some expected impacts from this project during the coming 5 years are as follows:

- Availability of primary national standard traceability across the entire millimetre-wave region (30 GHz to 300 GHz)
- Routine calibration services for Vector Network Analyser (VNA) Electronic Calibration Units
- Routine calibration services for multi-port devices, including devices on high-speed Printed Circuit Boards (PCBs)
- Accessible traceability, via verification artefacts, for nonlinear and extreme impedances
- Up-to-date 'quality-related' documentation – (i) the EURAMET VNA Guide; (ii) IEEE standards for waveguide and coaxial lines

Based on the above 'Impact' indicators and expected impacts, the overall self-assessment rating for this JRP is given as: "**(3) Substantial**: Evidence for economic and societal impact, as a pronounced result of the research".

Information on standardisation

Standards Committee / Technical Committee / WG	Partners involved	Likely area of impact / activities undertaken by partners related to standard/committee
IEEE P1785 Standardisation - Working Group	Partner A (chair), Partner D	Partner A and Partner D presented the work on geometric features and electrical behaviour at the annual meetings of this WG. Feedback was sought which was taken into account in the selection of the geometrical dimensions of the coaxial connectors. A new IEEE documentary standard (Pxxx) is being written for rectangular metallic waveguides operating at high frequencies, which includes data obtained and validated in this project. Partner A provided a report to this WG and participated in the preparation of this new standard.
IEEE P287 Standardisation-Working Group	Partner A (chair), Partner D	An existing documentary IEEE standard (Pyyy) is currently being revised with the contribution of Partner A and Partner B. This revised standard incorporates new data for precision coaxial connectors that has been obtained in this project. Partner D has also presented the project at the meetings of this WG.
IEEE Working Group on microwave theory and techniques	Partner B, Partner D	Partner D, with support from Partner B, has prepared and delivered a proposal for the creation of a new IEEE WG to the IEEE Standards Association. This proposal suggested the new group to include experts from different countries and fields. Partner D will chair the new WG.
BIPM JCGM – WG1 “Measurement Uncertainty”	Partner C	Partner C has provided input to Supplement 3 of the GUM, which is at an early stage of preparation. Partner C has also presented the project at the meetings of this WG.
EURAMET - TCEM, SC-RF&MW	Partner A	An existing EURAMET Guide on the evaluation of Vector Network Analysers (VNA) is being revised and will include developments in VNA metrology achieved in this project. Partner A is a member of this committee and has presented the project at the annual meetings. Partner A is also working on the revision of the guide.

TP RPT projects only

The capability gap between the partners of the consortium and other NMIs/DIs in Europe is narrowing as a result of this project. Partner E has developed methods, which enable them to monitor the operational status of ECUs while reducing the uncertainty by a factor of 2. This is at the level of the uncertainty achieved by partner A and partner B, and will enable partner E to participate in a BIPM Key Comparison by the end of this project.

2.4 Implementation

Strengths and Weaknesses

The partners have shown a high level of engagement which has ensured that the project’s tasks have been delivered to a very high standard of quality and efficiency. All participants work well together and there have been no management issues to solve. Partner C has offered (unplanned) training and access to their equipment to partner E so that the multi-port measurements were not delayed for longer. Partner B is very experienced in dissemination and outreach activities and has been very active in the engagement of stakeholders.

The cooperation between participants still requires improvement. The scheduling of the activities for the second half of the project is envisaged to promote the joint research and collaboration. The improved collaboration will be reflected in the planned co-authored peer-reviewed publications. The capabilities of partner E and partner F have improved considerably in a relatively short period of time but are still relatively new.

Issues and deviations

There was a technical issue with the 4-port VNA at the facilities of partner E which led to a significant delay in the multi-port measurements and the establishment of uncertainty budgets. Partner C has offered their assistance and training and we believe that we will still be able to undertake an intercomparison of full and quick calibration schemes during the lifetime of the project, which was one of our key scientific and technical objectives.

The industrial partners and the stakeholder committee often find it difficult to attend the face-to-face project meetings. This is often due to internal restrictions of the companies. For this reason, it has been decided to hold the stakeholder committee meetings via teleconference, even if this is not ideal.

Cooperation and joint research

The cooperation between partners will increase in the second half of the project when sharing of equipment and data will be central to many activities. In the first 18 months, partner C has offered partner E unplanned training and access to their facilities.

The activities planned for the first half of the project did not involve much joint research. However, the partners have exchanged knowledge about characterisation measurements and PCB components. Such exchange of knowledge has led to results that could not have been achieved by a single NMI. For example, the advice from partner D has been very helpful in overall improvements to designs for PCB components being realised by partner E. Also, during the first 18 months, partners A, C and D have started to revise a EURAMET Guide for VNAs.

2.3 Opportunities and Threats

Elaborate on the main opportunities and threats you see for the successful exploitation of the project outputs. Indicate how to avoid/limit/minimise the threats and leverage/enhance/maximise the opportunities.

State how your project depends on the actions of the partners and/or external stakeholders beyond the contract to achieve the results.

Which decisions need to be taken and by whom to ensure that results are taken up?

Please complete the 'Opportunities and Threats' as shown in the example below:

Example

3 Opportunities and Threats

The main opportunities and threats for the successful exploitation of the project outputs are summarised below:

Opportunities

- Interactions with professional societies (such as IEEE, EuMA, etc) – this includes participation in the organisation of international scientific conferences in this area of technology, as well as workshops, seminars, training courses, etc. Active representation on appropriate technical committees with such societies is enhancing these opportunities;
- Links to regional metrology organisations (EURAMET, AMPM, etc) – this ensures the established new and improved traceability mechanisms are receiving public exposure to the relevant user communities (in Europe and elsewhere). Active representation on appropriate EURAMET, BIPM, etc, technical committees is helping leverage these opportunities;
- Continuation of the European ANAMET Technology Forum meetings – this will enable knowledge exchange within the European region (including those from outside the consortium) to be continued. This should be achieved through self-funding mechanisms (modest meeting registration fees, etc);

Threats

- Lack of a formalised project framework (beyond this project) could mean that best intentions for future exploitation of the project outputs could become dissipated and/or deployed elsewhere. This threat could be minimised by obtaining some form of follow-on (i.e. maintenance) funding;
- NMIs subsequently prioritising other areas of science and technology could limit the longer-term sustainability of successful exploitation of the project outputs. This threat could also be minimised by obtaining some form of follow-on (i.e. maintenance) funding.

This project depends on the long-term commitment (beyond the lifetime of the project) of all the partners to maintain, and even further develop as appropriate, all capabilities that are being established by outputs from this project.

Established partnerships with external stakeholders ensure the continued relevance and applicability of the outputs from the project.

Decisions on appropriate long-term funding and resource allocations need to be taken by the managements of the participating NMIs, the relevant Technical/Consultative Committees within EURAMET and BIPM, and end-user groups in industry in order to ensure appropriate take-up of results. Again, the maintenance and development groups could be instrumental in such a long-term plan for the take-up of results by industry and for the maximum impact.

2.4 Summary

To summarise, please give the headlines of what you want to have achieved at the end of the project and how you expect your partners and stakeholders to make use of that achievement in the 5 years following the end of the project.

What will make your project a success?

What will remain from your work?

Please complete the 'Summary' as shown in the example below:

Example

4 Summary

The key targets to be reached by the end of this project (and to be exploited in the 5 years that follow the end of the project) are as follows:

- New SI traceability for measurement quantities used in high-frequency electronics applications. This new traceability will enable end-users to exploit frequency regions with the confidence that comes from having the availability of traceable measurements.
- New customer calibration services for new types of measurement and new types of device. These new calibration services will allow users of 'new' measurands (such as X-parameters) and new devices (ECUs) to quantify quality attributes such as traceability, measurement equivalence and reproducibility, etc.
- A knowledge resource (i.e. source of European expertise) for those using and requiring state-of-the-art measurements for applications in production, manufacturing, testing, research and development. This knowledge base will be accessible and deployable in future research and development projects and initiatives supported by funding mechanisms such as Horizon 2020.
- Incorporation of work and results e.g. rectangular metallic waveguides and VNA metrology, into new and revised documentary standards. This will ensure inter-comparison of data and reduce the existing gap between NMIs and manufacturers of new devices, therefore supporting European innovation.
- *For RPT projects only*: narrowing of the capability gap within the consortium in terms of the operational status of ECUs.

This project will be considered a success if these targets are met and the long-term aspirations (for continued traceability and measurement services) are sustained. It will be these services and capabilities that will remain beyond the lifetime of this JRP (for a period of at least 10 years or more).

3 The Presentation

This section is not applicable to TP NRM projects.

The EURAMET MSU provides a structure for the presentation to be given at the mid-term review meeting. The presentation shall be sent to the EURAMET MSU prior to the meeting.

The presentation is aimed at supporting the claims made in your self-assessment, more specifically the Technology Position and Impact score. It shall include one or two brief overview slides and it will then focus

on the project's objectives (briefly), **achievements and justification for the Technology Position and Impact score**.

The **timetable is very tight** and you will be asked to stop once your scheduled time is over, even if you have not reached the end of your presentation. Therefore, you should carefully consider how to get your key messages across in the time available. Your presentation should primarily highlight achievements, justification of technology position and impact, and not future work. The EURAMET MSU will inform you of the duration of the slot for the day.

The presentation should be in PowerPoint (and of a size that can be emailed to the EURAMET MSU) and should follow the suggested outline below:

- Title: 1 slide
- Introduction: 1 or 2 slides
- Objectives: 1 or 2 slides
- Achievements: 2 to 4 slides
- Technology position score: 1 or 2 slides
- Impact score: 1 or 2 slides
- Summary: 1 slide