

# The European Metrology Research Programme in Action

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## Abstract

As the new millennium dawned the European National Metrology Institutes were faced with what we now refer to as the “European metrology dilemma”. Demands for wider scope and greater precision from traditional stakeholders, the need to support emerging areas such as biotechnology and nanotechnology, and the greater demand from established areas such as food safety, clinical medicine and environment, whilst public funding was broadly static, requiring a paradigm shift in the way we operated. The European Metrology Research Programme – the EMRP – allows Europe to assemble critical mass amongst the NMIs to tackle major research projects in a coordinated and collaborative manner addressing fundamental metrology, metrology for industry and innovation, and metrology improving the quality of life. The EMRP became a reality with the first phase of 21 joint research projects, selected through an independent evaluation process, and totalling some 64.6 M€ launched between February and July 2008. The second much larger phase began when the first call for potential research topics, addressing metrology needs in the energy sector, was launched in May 2009. This 400 M€ second phase will run over a number of years with annual calls and uses a major instrument of integration, that is Article 169 of the European Treaty. The EMRP is jointly funded by the European Commission and the 22 participating countries. This paper will update progress on the first phase and second phase of the EMRP, whilst reflecting on the challenges and critical success factors associated with launching large-scale programme level collaborative ventures.

## 1. Introduction

Measurement underpins virtually every aspect of our daily lives, helping to ensure quality and safety, to keep us healthy and to help us innovate and keep our economy competitive. Our understanding of key issues such as climate change, the quality and safety of the food we eat, the air we breathe and the water we drink, and the goods we buy, all rely on our ability to make ever better measurements. In industry measurements are crucial in manufacturing, process control, telecommunications, transport and many other sectors, not least to remain competitive. Our ability to measure defines the boundaries of possibility. What we cannot measure, we generally do not understand properly and we cannot make accurately nor control reliably. Sound data based on reliable measurements forms a cornerstone of evidence needed for successful

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policy-making and regulation. Thus advances in the science of measurement – metrology – have a profound impact on understanding and the shaping of the world around us [1].

Practically all governments in advanced technological countries and many less developed countries support a measurement infrastructure because of the benefits it brings. In many countries national research programmes and activities respond to the demand for measurement standards of ever increasing accuracy, range and diversity, striving to improve that measurement capability. Although there are differences, broadly all have the same three core objectives; to support industry and drive innovation, to support sound policy and regulation (and thus to protect both the citizen and the environment) and to provide ever better tools for other scientific disciplines. The measurement infrastructure and the associated research are managed and delivered via the National Metrology Institutes (NMIs)<sup>2</sup>. The NMIs are additionally charged with ensuring that the international system of measurement, the SI [2], functions appropriately, including the primary realisations of the base units and the dissemination to stakeholders. In the modern global economy comparability of measurements and interoperability are crucial, with perhaps the most obvious example being the atomic clocks in the NMIs that form the basis of international time keeping, and with it communications, banking, navigation etc.

The origins of collaboration amongst the European National Metrology Institutes (NMIs) lay back in the early 1970s with the establishment of the Western European Metrology Club (WEMC). As indicated from the name this rather informal organisation provided a forum for the Directors of the NMIs to meet and discuss matters of mutual interest. This arrangement continued for almost 15 years, spinning out a succession of structures focusing on laboratory calibration that, after being brought together with accreditation of certification interests, became the current body European Accreditation (EA). The metrology interests eventually evolved into two bodies, with the launch of the European Collaboration in Measurement Standards (EUROMET) in 1988, the Western European Legal Metrology Collaboration in 1990 (WELMEC).

The EUROMET collaboration operated successfully for almost 20 years, with particular focus on supporting the development of scientific metrology in Europe during a period of significant change. Additionally from the late 1990s the organisation took on the responsibility as the Regional Metrology Organisation for Europe under the CIPM Mutual Recognition Arrangement [3]. The identification, development and delivery of joint research projects also fell within the remit of EUROMET, and a significant database of successful projects was built up over the years. However on detailed examination it became evident that in many cases joint research projects were hampered by the different national systems used to fund each partner, including mismatches in the timing of prioritised work and the lack of availability of funds to address a particular topic, and thus the vast majority of R&D, other than that associated with comparisons, continued to be delivered nationally rather than jointly.

## **2. MERA and iMERA – Considering the Metrology Dilemma**

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<sup>2</sup> In many countries the metrology system is made up of more than one laboratory, the laboratories may be collectively known as “the NMI” or there may be a lead laboratory “the NMI” plus additional “designated institutes”. For brevity the term NMI will be used throughout, but will in many cases also refer to the wider distributed formal NMI laboratory systems.

As the new century dawned pressures increasingly stretched the ability of the European NMIs to address stakeholder needs effectively, particularly in terms of cutting edge R&D. Regulation, quality of life, innovation and fair trade all require an effective and advancing metrology infrastructure. Demands for wider scope and greater precision from traditional stakeholders (typically industry), the need to support emerging areas such as biotechnology and nanotechnology, and the greater demand from established areas such as food safety, clinical medicine, the environment, and more recently security, required a re-examination of the *modus operandi*. Many of the new or highest priority challenges affect most countries and require resources beyond those of an individual NMI. It was clear that realistic expectations on budget increases in the European NMIs would not be sufficient to resource the growing demands, stretching the available resources so far that there was a significant risk of becoming sub critical and thus damaging the excellence of the research carried out. Action was therefore required to begin to address the so-called “European metrology dilemma”. In addition around this time and at a much more generic level the European Commission was identifying fragmentation between national programmes within the European research community as a major barrier to optimising the impact of the research effort in Europe.

The European NMI community, led by NPL in the UK, responded within the European Commission’s 5th Framework Programme by conducting a study “*Metrology for the European Research Area*” – MERA – [4] which analysed the metrological needs for Europe at the beginning of the 21st century and considered options for the way forward. As well as confirming the prevalence of the “European metrology dilemma” the study concluded that the most realistic option to address the dilemma was to significantly increase the impact of European metrology research through much greater coordination and collaboration.

In April 2005, under the 6th Framework Programme, and as a direct consequence of the outcome of the MERA study, representatives from 14 countries plus the European Commission, comprising 15 EUROMET members and 5 ministries, together launched a 3 year ERA-NET “implementing MERA” (iMERA). The iMERA project [4] enabled the NMI community to understand, plan and trial closer collaboration, and to develop the conditions and design the structures to enable the NMIs to conduct coordinated and collaborative metrological research in identified areas of strategic importance. Crucially iMERA included a dedicated work package investigating in consultation with the European Commission, the potential for achieving the desired step increase by pooling national and Commission resources in a joint European metrology research programme (EMRP) utilizing Article 169 of the European Treaty.

The iMERA project resulted in a number of key achievements, particularly:

- For the first time the national funding ministries, who prior to the project had had little or no contact or knowledge of their counterparts in other countries, had the opportunity to get to know one another, to develop an understanding of how each other operates, how priorities are established, the constraints on the funding cycles and the potential for encouraging collaboration.
- A sea change in the organisation of metrology collaboration in Europe with the establishment in January 2007 of a new “not for profit” legal entity “EURAMET e.V

incorporated in Germany. This body took over responsibility as the Regional Metrology Organisation for Europe under the intergovernmental Metre Convention in the summer of 2007.

- The development of the Outline European Metrology Research Programme
- Development of the concept of a joint metrology R&D programme, and the identification and development of proposals for the funding mechanisms - ERA-NET Plus and Article 169
- Launching the first phase of the European Metrology Research Programme through the iMERA-Plus project
- Launching the second phase of the European Metrology Research Programme through Article 169

### **3. Developing the European Metrology Research Programme**

In parallel with the establishment of EURAMET, the iMERA project also elaborated the European Metrology Research Programme (EMRP) over a two-year period. The aim was to develop a programme that would address the need to support innovation, quality of life and European policy and the scientific community incorporating the wider horizontal grand challenges in addition to the metrology sector specific needs, and with the ultimate goal of a programme that could be launched under Article 169 of the European Treaty.

As preparation for this work EUROMET/EURAMET established a number of focus/interest groups for life sciences, biotechnology, new materials and software and mathematics, to address metrological areas not covered by the existing Technical Committees.

In developing the programme it was important to understand and incorporate the wider stakeholder needs and to source input from outside the metrology community. As part of the process consultation was undertaken through a series of stakeholder workshops and focus groups covering health, energy, environment and security. The workshops included representatives from the medical profession, a medical research council, pharmaceutical industry, the Joint Committee on Traceability in Laboratory Medicine, power generation industry, oil and gas industry, an organisation involved in nuclear fusion research, environment agencies, universities and policy Directorate Generals of the European Commission.

The second strand used as an input to the programme was an extensive roadmapping exercise undertaken by the EUROMET/EURAMET Technical Committees and new focus groups.

With the knowledge gained a dedicated work programme - the European Metrology Research Programme (EMRP) - was published in early 2007 and revised and reissued the following year to align with the requirements of the Article 169 [5]. The EMRP addresses grand challenges in health, energy, environment and new technologies for nano sciences and security, plus R&D for fundamental and applied metrology and additionally some capacity building. The fundamental and applied metrology areas include ionising radiation, electricity and magnetism, time and frequency, photometry and radiometry, mass and related quantities including acoustics, length, chemistry, biotechnology and materials metrology.

#### **4. Piloting the EMRP in iMERA-Plus**

As the European Commission's 7th Framework Programme was being developed it became clear in late 2006 that there was an opportunity for an EC funding bridging measure on the road to Article 169, utilising the new ERA-NET Plus mechanism introduced under FP7 as part of Commissioner Janez Potočnik's revitalisation of the European Research Area. This mechanism provided the possibility of a one-off call for transnational research projects that would receive approximately one third of their funding from the EC.

The proposal for the iMERA-Plus project was submitted and was successfully evaluated and selected, securing 21M€ of funding from the European Commission. The level of EC funding was however only sufficient to enable four of the targeted areas within the EMRP to be released in the one-off call. In late May 2007 following an short interim period to define and develop the necessary procedures and documentation, the call for expressions of interest in the fields of metrology underpinning SI and Fundamental Metrology, Health, Length and Electricity and Magnetism was issued. The institutes eligible to receive EC funding under iMERA-Plus had to be publicly funded for metrology as a recognised part of a national measurement system (typically the NMI, or DI), have existing appropriate metrology R&D expertise, and be willing and able to accept the duties and obligations associated with participation. Additionally, by exception, for countries launching metrology R&D programmes for the first time whose NMIs did not currently have an in-house R&D capability, the NMI/DI in partnership with the publicly funded R&D institute with metrology expertise who are assisting their NMI to develop specific R&D capabilities were also eligible to participate. The call was open to institutes meeting the above criteria from the following countries: Austria, Belgium, Czech Republic, Denmark, Estonia, Finland, France, Germany, Italy, Norway, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, the Netherlands, Turkey, UK, plus the Institute for Reference Materials and Measurement of the European Commission. Some 405 "areas of interest" from 44 organisations were submitted in 98 EoIs

Facilitation meetings were held during the summer of 2007 for each of the 4 thematic areas and experts nominated by each of the interested institutes begun the process of developing the "areas of interest" into 39 proposed joint research projects (JRPs).

The JRP proposals were evaluated at a Review Conference held in late October 2007 by panels of independent international experts selected from outside the European NMI community. Prior to the final evaluation a poster session was held for all the JRPs enabling the referees to discuss issues and points for clarification directly with the proposed JRP coordinators. The outcome of the Review Conference was a ranked list of the JRPs, of which 36 were classified as suitable for funding although there was only funding to support the 21 top ranked projects. The EMRP Committee then endorsed the list at a meeting the following day. As part of the evaluation, the European Commission required that the Research Council provide an independent opinion on the overall process. In mid January 2008 the Commission formally approved the ranked list, including the JRPs selected for funding and the successful JRPs are shown in Table 1. More than 64.6 M€ R&D funding is committed to the programme of which 21 M€ is provided by the European Commission, the remainder from the participating NMI and DI budgets.

Table 1. List of funded Joint Research Projects under iMERA-Plus

JRP No.	TITLE OF JOINT RESEARCH PROJECT
T1.J1.1	The watt balance route towards a new definition of the kilogram
T1.J1.2	Avogadro and molar Planck constants for the redefinition of the kilogram
T1.J1.3	Foundations for a Redefinition of the SI base unit Ampere
T1.J1.4	Determination of the Boltzmann constant for the redefinition of the kelvin
T1.J2.1	Optical clocks for a new definition of the second
T1.J2.3	Candela: Towards quantum-based photon standards
T2.J02	Breath analysis as a diagnostic tool for early disease detection
T2.J04	Metrology on a cellular scale for regenerative medicine
T2.J06	Increasing cancer treatment efficacy using 3D brachytherapy
T2.J07	External Beam Cancer Therapy
T2.J10	Traceable measurements for biospecies and ion activity in clinical chemistry
T2.J11	Traceability of complex biomolecules and biomarkers in diagnostics effecting measurement comparability in clinical medicine
T3.J1.1	Traceable characterization of nanoparticles
T3.J1.4	New Traceability Routes for Nanometrology
T3.J2.2	Metrology for New Industrial Measurement Technologies
T3.J3.1	Absolute long distance measurement in air
T4.J01	Next generation of power and energy measuring techniques
T4.J02	Nanomagnetism and Spintronics
T4.J03	Next generation of quantum voltage systems for wide range applications
T4.J04	Enabling ultimate metrological QHE devices
T4.J07	Traceable measurement of field strength and SAR for the Physical Agents Directive

Key

SI and Fundamental metrology
Health
Length
Electricity and magnetism

Following the formal approval of the list, the contracts for the JRPs were negotiated and contacts issued by EURAMET, the project start dates ranging from February through to July 2008. Information on the projects is available from the EURAMET website.

## 5. The Road Towards Article 169

With the ERA-NET Plus underway attention refocused on the ultimate goal of a programme that could be launched under Article 169 of the European Treaty, and this has been recognised by the European Commission in their statement below:

***“ARTICLE 169 INITIATIVE IN THE FIELD OF METROLOGY***

Article 169 enables the interested Member States (and those states associated to the EC Framework Programme) to work with the European Commission to create large-scale multi year programme for Phase II of the EMRP, funded by the 22 participating countries and the European Commission. The second phase has a total value of 400 M€ over approximately 7 years, and includes some useful enhancements over the first phase. For example the programme will provide the opportunity for the user community and other stakeholders to directly suggest topics that the NMI community should address with its resources. Additionally researcher excellence grant funding will be available to bring



external expertise into the projects, and there will be the opportunities for organisations to participate in the projects with their own resources where it is mutually beneficial to do so.

The stated aim of the Article 169 initiative was “... to launch and implement a cohesive joint metrology R&D programme integrating a number of national programmes/activities, which will enable Europe to respond to the growing demands for cutting-edge metrology as a tool for innovation, supporting scientific research and policy. The initiative will support, in particular, the objectives of the European National Measurement Systems delivered via the National Metrology Laboratory networks.”<sup>3</sup>”

The metrology Article 169 required a formal proposal by the European Commission that was made in December 2008, and then Co-decision by Council of Ministers and the European Parliament in the first half of 2009. A major step forward was achieved on 22 April 2009 when the plenary session of the European Parliament voted overwhelmingly in favour of the European Metrology Research Programme Article 169. The next steps are the legal translation of the texts, and then formal adoption by the Council of Ministers, scheduled for late May 2009. The texts will then be signed by the legislating parties, the Council of Ministers and the European Parliament and published in the Official Journal of the European Union. Whilst the process is still not complete, the legislative and administrative processes were proceeding well and are sufficiently close to conclusion for EURAMET, in agreement with the European Commission, to launch the first Call for proposals (for metrology research supporting the energy sector) in mid May 2009. This call will eventually support joint research projects of almost 30 M€ value and researcher grants of some 3.4 M€. Further calls will address metrology for the environment, metrology for industry, the health sector, the SI, and new technologies

The two-stage research project selection process opens with an initial call for potential research topics that are subsequently be prioritised by the EMRP Committee. The highest priority topics are then published with requests for full project proposals, which are then subject to evaluation by independent referees. EURAMET expect to publish 5 annual call cycles over the lifetime of the programme. It is anticipated that the R&D projects would be similar to those under iMERA-Plus. Three mechanisms will be introduced to respond to the need to open up the second phase of the programme. Firstly the opportunity to submit topics/ideas for areas of research to potentially be undertaken collaboratively by the NMIs and DIs is open to any organisation or individual. Secondly the introduction of researcher grants, the bulk of which will be available only to those outside the participating NMI community to work on the JRPs. Funding is however, limited to European participants. Thirdly organisations will be able to participate in the JRPs with their own funding.

Developing the EMRP has taken extensive effort over a number of years, bringing together the views of more than 20 countries, their NMIs and ministries, who all had to be persuaded to some degree or another to commit to the programme, handing over sovereignty to the EMRP joint processes with regard to decision-making for the associated budgets. The success of the initiative has depended on effort, determination, skill and a measure of good luck. It is worth reflecting on some of the critical success factors:

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<sup>3</sup> 54/79 ANNEX IV JOINT TECHNOLOGY INITIATIVES AND COORDINATION OF NON-COMMUNITY RESEARCH PROGRAMMES - Corrigendum to Council Decision 2006/971/EC of 19 December 2006 concerning the specific programme ‘Cooperation’ implementing the Seventh Framework Programme of the European Community for research, technological development and demonstration activities (2007 to 2013) (Official Journal of the European Union L 400 of 30 December 2006)

**1. Understanding the issues and environment:** Without fact based understanding of the initial situation and landscape, taking any initiative forward is difficult and fraught with the risk of being discredited before it gets off the ground. In developing the EMRP we used the MERA study to analyse where we were and what options were open to us for the future, being careful not to jump to any conclusions at this stage. We followed this up in iMERA by a more formal review of the state of the art in terms of what each of the NMIs were doing, providing a baseline from which to move forward. We also conducted a review and assessed the funding options available to us, updating the review as circumstances developed.

**2. Soundness of the case:** It is natural to be fired up with enthusiasm when ideas for new ways of working, ways that will potentially attract large amounts of research funding, are first launched. An early and dispassionate assessment of the underlying value of the case is a must for any such initiative, initially to be undertaken early on before significant resources are committed, and revisited at each key stage of progression. Formally this task was at the core of the MERA and iMERA project, with the responsibility passing to the EMRP Committee following its establishment in January 2007. Informally the team leading the initiative repeatedly and frequently revisited the issue and tested the ongoing case as the initiative took shape.

**3. Assessing the potential:** Understanding the likelihood to be able to move at all from what had been the status quo for some years, and the degree of ambition and speed of change, were essential ingredients before we could “set out our stall”. We therefore assessed the commonality of vision amongst the likely players. Not surprisingly this was quite high as NMIs have broadly similar missions, broadly similar sources of (public) funding, and all work primarily for the public good with varying degrees of overlap in the technical areas in which they are active. We then moved on and assessed the potential likelihood of succeeding in ramping up collaboration in research and development amongst the NMI/DI community. The foundation stones were already in place. NMIs already work together within the frame of the Metre Convention [2] supporting the development of the *SI*, and collaborating in international scientific comparisons is the “bread and butter” activity for those holding national measurement standards. Furthermore much of the output from NMI research is only meaningful if internationally accepted, a process enhanced by international collaboration in the research. That is not to say that all research activity is suitable for the international collaborative pot, particularly one that uses the heavy, expensive and slow processes that are inevitable companions of European public funding. Many projects do not need collaboration at all, or even if they could be done collaboratively, are too small to warrant the effort required. Collaboration by definition requires some degree of relinquishing national control, coordination takes time and effort and if suitable resources are already available nationally the motivation to collaborate will be significantly reduced. Other initiatives might be too close to market, for example the development of a new instrument might need one NMI, but not many, with the preferred partners being instrument manufacturers and users. Some projects have high national prestige, or are perhaps related to national policy or defence issues, and are not appropriate for the international pot. Yet others address issues that are of national concern, but of less interest further field. That said, the nature of NMI activity is such that a good deal of the NMI research landscape is at least in principle, suitable for collaboration amongst the NMIs.



**4. Action and leadership:** It is very easy to simply wish for change and be convinced of the potential, but progress depends on positive action. Someone somewhere needs to be prepared to “step up to the mark” and lead the process of change, convincing, influencing and motivating those around. A proven track record is a valuable tool, and in our case we started out modestly, pursuing a stepwise approach, maintaining and building momentum along the way. The 8 country 400 k€ MERA study was followed by the 14 country 4 M€ iMERA network, was followed by the 19 country 64.6 M€ iMERA Plus Phase I of the EMRP, to be followed by the 22 country 400 M€ Phase II of the EMRP.

**5. Consultation and stakeholder needs:** As ideas coalesce and plans are made, consultation is obviously essential. Internal consultation amongst the players regarding the concepts was the starting place, augmented with dialogue with wider external stakeholders to establish the basis of the content of the proposed programme. The consultation process starts early on and it never really ends. We conducted a number of studies and surveys in MERA and iMERA to establish what the partners and the wider community thought, expected and wanted. Feedback helped shape the iMERA project itself, and certainly shaped the EMRP. In the consultation process, and particularly in the internal process where we were asking national governments to commit resources and give up sovereignty on decision-making, we adopted a policy of developing a programme that offered as far as possible a “win-win” situation for everyone. This was no mean feat; the size of engagement of the different countries in the final Article 169 programme varies enormously

**6. Dealing with complexity:** Major initiatives involving many countries by definition tend to be complex, and success often hinges on what, at one moment in time seems to be just a minor detail, yet it is impossible to address all details with the same level of attention. However a lot can be done to help manage complexity, two key examples from the EMRP initiative were the “Guiding Principles” and the “Cornerstones”. The guiding principles are best expressed as an expansion of the vision, a description in non-legal or contractual terms, just 3 pages long in our case, of what we were trying to achieve and the fundamental principles we would honour en route. Written overnight at a two day meeting in December 2005 this document was the embodiment of all that we set out to do, laid out in a way that all those involved in the initiative could understand and sign up to. This then enabled a much smaller and more focused team - the “Core Group” made up of Andy Henson, at that time leader of the iMERA project, later EMRP Programme Manager, Luc Erard, Chair of the EMRP Committee, (the Committee of representatives of those countries participating in the EMRP), and Michael Kuehne, at the time of the key negotiations the Chairperson of EURAMET (the role of Chairperson passing to Leslie Pendrill in early 2009) - to develop the details of the proposed programme structure and modus operandi without having to revert at every point to the wider group for endorsement. The second document, the “Cornerstones” was developed later in the process as the basis of a formal mandate; specifically for the negotiations with the European Commission. The Cornerstones addressed each of the basic elements that would be covered by such a negotiation, again laid out in clear terms over a few short pages. We operated a methodology of breaking down major challenges into manageable steps, following the old adage “How do you eat an elephant – one slice at a time”. Indeed one of the key skills necessary to keep 22 NMIs and 22 Ministries pulling in the same direction is distilling the sheer complexity of the undertaking into understandable key elements.

**7. Underpinning work:** Unless one is very lucky, major initiatives require significant underpinning work to prepare the case, develop the initiative, assess the impact and brief the stakeholders and influencers etc. Resource discussions need to be realistic; to onlookers progress seems generally slow, in reality for those involved it is rather like a duck swimming upstream, slow progress on the surface, achieved by sustained and frantic paddling below. Any slackening or weakness in resolve quickly results in the initiative being swept far downstream, possibly over a waterfall to oblivion. We were blessed with support teams who were skilled, highly motivated and prepared to apply themselves over long periods of time.

**8. Credible support and key influencers:** Rather like a baby, any major initiative is wonderful in the eyes of those who conceived it, however this sense of wonder may not automatically be shared by the wider world. Simply proclaiming the wonder of the initiative ever louder is unlikely to win the hearts and minds amongst those who matter. For success the value of the initiative and the potential benefits have to be communicated in a way that is meaningful to the audience. For example it was obvious that few Members of the European Parliament would even be aware of the metrology infrastructure, and were hardly likely to give it high priority when pitted against competing needs from areas with higher political profile. Thus some two years prior to the Parliamentary vote we initiated a campaign to bring key MEPs to the NMI laboratories, explain who we are and what we do and demonstrate the value of the research undertaken by our community. These same MEPs later became the core support in the European Parliamentary Committee preparing the dossier for the plenary parliamentary vote. We remained sensitive to the political objectives that motivate bodies such as the European Commission, the European Council of Ministers and the European Parliament, who prized the increasing integration of European research as highly as the potential research results from that collaboration.

**9. Feedback:** As an instrument as complex as the EMRP evolves it is essential to try to build in relevant feedback from appropriate sources. In Phase I we were able to gain experience of operating a significant scale joint call with independent evaluation, and a number of lessons were learnt that influenced the shape of Phase II, although it has to be said that the main changes were equally driven by other external factors.

**10. Managing tensions:** Whilst the overall commonality of mission and vision was a major factor in the successful development of the EMRP, inevitably with 22 NMIs and 22 ministries involved there were divergent views as each country tried to optimise the shape of the programme from their particular perspective. We adopted the practice of considering all suggestions, and criticisms, dispassionately and on their merit, adapting the programme as appropriate, offering options to the EMRP Committee, sometimes accompanied by recommendations. Most tensions arose from the restrictions associated with the European funding, the provision of which came at least in part with an ideological price tag in terms of the shape of the programme. However the relationship with the Commission Services was first class, a necessary pre requisite for success in an initiative that did not have a natural high political profile, and which required a gruelling process within the European Commission of “taxing” various areas of the research budget to support the cross cutting metrology initiative.

**11. Demonstrating Impact:** Quite rightly the European Commission commissioned an independent impact assessment from a team of experienced economists and science policy consultants. We immediately adopted an “open book” approach, providing information, views etc “unedited”, believing that our fundamental case was sound, and confident that this team of experts would come to the same conclusion, which in due course they did.

**12. Managing Risk:** Formal management of risk is not only a natural expectation for proper governance, but also an extremely useful, and often-underrated tool, focusing the limited development resources on the most crucial issues and helping build a sound initiative. A distinctive risk management strategy was operated informally from the early stages of development of the EMRP and is now embodied as a formal process owned by the EURAMET Board of Directors.

## 6. Conclusions

The European collaborative metrology infrastructure has come a long way since the start of the new millennium. The desire to implement a step change in the impact obtained from collaborative research can be seen from the growth in the number of European countries participating in the European initiatives MERA, iMERA, iMERA-Plus or committing to the potential Article 169 (see Figure 1 below).

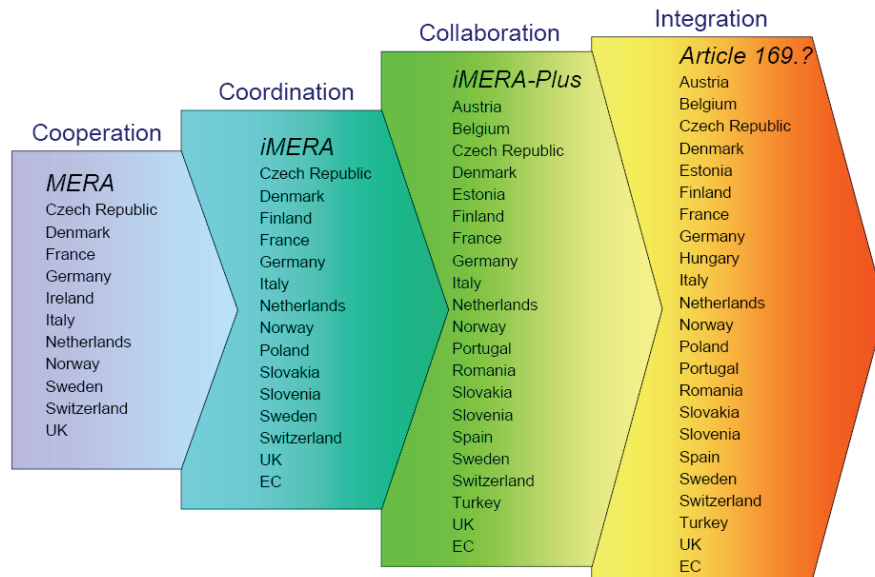


Figure 1: Participation in European metrology initiatives

The first phase of the European Metrology Research Programme is underway, with more than 64 M€ committed to R&D using a two-stage call and selection process, including joint evaluation at European level by independent referees. The European Commission provided 21 M€ of the funding, with the participating countries providing the balance of resources. The call involved 20 countries and as well as selecting 21 excellent Joint Research Projects for support, has enabled EURAMET to both demonstrate its ability to successfully organise and manage a

call and selection process on a scale relevant to Article 169, and to pilot many of the necessary processes that will be used under Article 169. Preparations for the proposed second phase using Article 169 of the European Treaty are well advanced and the first call for ideas for potential research topics in the field of metrology for the energy sector was launched in mid May 2009..

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