CEN Workshop 24:

“Risk Based Inspection and Maintenance Procedures for European Industry”

Business Plan

1) Background to the CEN Workshop “Inspection and Maintenance Procedures for European Industry”

Current practice to inspection and maintenance planning is for most industries based on traditional and prescriptive rules rather than on optimised process where risk measures for safety and economy are integrated. New technology for taking Risk Based decisions is emerging within a broad range of sectors, and has proven to be a very efficient tool. To addresses a wide range of industries (petrochemical, chemical, steel works and power industries) a unified approach to risk based maintenance and inspection planning was developed in an EU-supported research project known as RIMAP project (G1RD-CT-2001-03008). The main activities carried out by this project were:

- cost-optimised inspection/maintenance plans that will save operational and risk costs in the order of 10 to 40% for the industries involved
- improved safety for plant personnel and the society en-large
- a technical framework for a European standard

Several initiatives for standards in the US (API, ASME & EPRI) have proven to be successful, but these may not be in line with the European legislation and design practice and local safety and environmental requirements. The RIMAP Project has developed such a unified approach (RIMAP Procedure), which can be used as a
standard within the area of inspection and maintenance in Europe. The work was done (2000-2004) in five work packages and case studies for different industry groups:
- WP1: Current practice within the involved industries.
- WP2: Development of a generic RBMI method, based on a multi-criteria decision process.
- WP3: Development of detailed risk assessment methods, damage models for different industry sectors, the use of inspection data.
- WP4: Development of RIMAP application workbooks: guidelines for development of Risk Based Inspection and Maintenance plans per industry sector (petrochemical, chemical, power and steel).
- RIMAP DEMO (case studies) for petrochemical, chemical, steel works and power industries

This basic developing of the procedure was done in RIMAP RTD and DEMO projects (http://research.dnv.com/rimap). The work was disseminated via the RIMAP Thematic Network project (G1RT-CT-2001-05027), through workshops, seminars and papers in order to achieve acceptance and feedback for the methods. RIMAP Network has developed an interactive web site including innovative aspects in dissemination and education, like e.g. web-based teaching courses (http://www.mpa-lifetech.de/RIMAP).

The Thematic Network focuses on exchange of information between the network and the RTD project, harmonisation and co-ordination, and disseminating RIMAP results through entities such as the European Pressure Equipment Research Council (EPERC, see www.eperc.bam.de ), as well as the European regulatory bodies and the industry groups addressed in RIMAP. Within the activities of the RIMAP Network, potential third parties interested in RIMAP results will be identified (e.g. consultancy companies, legislative bodies, etc). Co-operation with this wide range of organisations through the RIMAP Network is intended to last throughout the lifetime of the project, thus ensuring successful exploitation as well as successful project. Furthermore, the co-operation of RIMAP Network with other networks such as PRISM, SAFETYNET, ELAPSE, EEMUA, EURISK, ENIQ and the contacts of the individual partners are foreseen.

The main RIMAP RTD Project deliverables are listed below.

<table>
<thead>
<tr>
<th>Deliverable No.</th>
<th>Nature of Deliverable and brief description</th>
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</thead>
<tbody>
<tr>
<td>D1.1</td>
<td>Report on Current Practice. (Restricted)</td>
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<tr>
<td>D2.1</td>
<td>Report describing the proposed RBMI method and the various levels. (Restricted)</td>
</tr>
<tr>
<td>D2.2</td>
<td>Guideline document on RBMI - revision 2.0. (Public)</td>
</tr>
<tr>
<td>D3.1</td>
<td>Risk assessment methods for use in RBMI. (Restricted)</td>
</tr>
<tr>
<td>D4.1</td>
<td>Guidelines on how to set up inspection and maintenance programmes. (Restricted)</td>
</tr>
<tr>
<td>D4.2</td>
<td>Guidelines on how to benchmark an inspection programme. (Restricted)</td>
</tr>
<tr>
<td>D4.3</td>
<td>Work book per industry sector. (Public)</td>
</tr>
<tr>
<td>D5.1</td>
<td>Report on validation. (Restricted)</td>
</tr>
<tr>
<td>D5.2</td>
<td>Templates for RIMAP demonstration. (Open)</td>
</tr>
<tr>
<td>D6.1</td>
<td>WEB-page for the project and its update during the project. (Restricted)</td>
</tr>
<tr>
<td>DEMO D1</td>
<td>Report from the Petrochemical demonstration. (Public)</td>
</tr>
<tr>
<td>DEMO D2</td>
<td>Report from the Power demonstration. (Public)</td>
</tr>
<tr>
<td>DEMO D3</td>
<td>Report from the Steel works demonstration. (Public)</td>
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<tr>
<td>DEMO D4</td>
<td>Report from the Chemical demonstration. (Public)</td>
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</tbody>
</table>

From the above listed deliverables as well as from the RIMAP internal deliverables the following ones may be used as a basis and/or referred to in the CWA:

- D2.1 “Generic RIMAP Procedure”
- D2.2 “RIMAP Framework”
- D3.1 “Risk assessment methods for use in RBMI” with appendices
  - I3.1 “Damage Mechanisms”
  - I3.2 “Consequence of Failure Determination”
  - I3.3. “Probability of Failure Determination”
  - I3.4 “Inspection and Monitoring”
  - I3.5 “Risk Aggregation”
  - I3.6 “Software”
- D4.1 “Guidelines on how to set up inspection/maintenance programme based on risk, cost and experience feedback”
• D4.2 “Guidelines on how to benchmark an inspection programme based on cost, risk and experience”
• D4.3 “Workbook per industry sector” – Petrochemical, Chemical, Power, Steel

The first two documents, namely the D2.1 and D2.2 will be used as the “backbone” of the CWA which should appear as document with the envisaged volume of about 30-50 pages (the preliminary estimate) in English. In accordance with the general CEN rules, the document will be completely public and its copyright will remain with CEN.

2) Origin of the CEN Workshop Proposal

The RIMAP Thematic Network (G1RT-CT-2001-05027) is a network project used for dissemination of the work done in the RIMAP RTD and RIMAP DEMO projects. Some of the members of RTD and DEMO are also members of the Thematic Network programme steering committee.

The following organisations as partners of RIMAP TN project have agreed to support the present Workshop proposal (by signing the TN contract whose description of work has a work package ‘Standardization’ where this task is described). The list is provided in alphabetical order.

<table>
<thead>
<tr>
<th>Nr.</th>
<th>Company</th>
<th>Contact person</th>
</tr>
</thead>
<tbody>
<tr>
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<td>6.</td>
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<td>9.</td>
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</tr>
<tr>
<td>10.</td>
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</tr>
<tr>
<td>11.</td>
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<tr>
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</tr>
<tr>
<td>13.</td>
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<tr>
<td>14.</td>
<td>FORCE Institute, Brøndby</td>
<td>Mr. Lars Nøhr-Nielsen <a href="mailto:lm@force.dk">lm@force.dk</a></td>
</tr>
<tr>
<td>15.</td>
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<tr>
<td>16.</td>
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<td>17.</td>
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<tr>
<td>18.</td>
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<td>Mr. Eduardo Dias Lopes <a href="mailto:edlopes@isq.pt">edlopes@isq.pt</a></td>
</tr>
</tbody>
</table>
3) CEN Workshop Market Overview

From a regulatory point of view, requirements within Europe for the inspection and maintenance of existing industrial installations are still administered at the level of the individual member states of the European Union. It follows that these requirements may be very different from one country to the other, even for very similar installations. Furthermore, the philosophy of regulation in different countries, from North to South, is quite different.

From an industrial point of view, practices differ from one industry to another, both for specific reasons and because there is little contact between different industries. The industry characteristics of each European country may also vary a lot from the North to the South.

RIMAP will enable a better integration of such processes to ultimately benefit European industry as a whole, by shortening inspection/maintenance time of preparation, and by optimising the inspection/maintenance ratio by balancing costs and risks.
In order to integrate the various trends of industry practices and local regulation within Europe, RIMAP includes several industries such as

- petrochemical,
- chemical,
- steel work and
- power generation

Industry, operators and their advisors come from a wide range of different countries. The positive benchmark of impact and transfer of industry practices will benefit all European industry and strengthen its competitiveness through better inspection and maintenance practices.

4) Objectives of the CEN Workshop

The main objectives of the Workshop are to

- make results of RIMAP more broadly usable and more competitive in EU and elsewhere
- produce the CWA document covering
  - basic procedure for RBI/RBIM
  - references to RIMAP results and other useful recognized sources
  - further recommendations and, optionally,
  - further details resulting from RIMAP and relevant for (e.g.)
    - damage mechanisms
    - PoF/CoF assessment
    - Inspection and monitoring
    - And other particular relevant aspects, as appropriate.

Intended possible users of the Workshop Document are

- Plant owners
- Service companies
- Regulators and
- Others involved in the process of asset management in the industrial plants concerned by this CWA.…

European Commission policy concerning technical harmonization has, on the one hand, sought to promote the free placing on the market, and putting into service, of different kinds of equipment (pressure equipment, machinery, etc.), and on the other hand to eliminate technical barriers for the trade. This technical harmonization is mainly concerned with fabrication of new products and equipment. The principles of technical harmonization have been based, among others, upon:

- Capability to deal with large families of products and/or horizontal risks, thereby limiting the number of internal market directives;
- Legislative harmonization, limited to the adoption of essential requirements for health, safety and protection of the environment.

The situation when operating newer plants is completely different from that of operating older plants. Most operational requirements are still based upon prescriptive codes and standards, which in their turn are based upon design considerations that do not always take into account the operational conditions of the plant, and therefore do not consider sufficiently the operational risks associated with health, safety and protection of the environment. This has the following negative consequences:

- The approach based upon prescriptive standards in many cases does not allow focusing inspection and maintenance resources where they really are needed in terms of operational risks and safety. This is further confirmed by the very different requirements in the different countries with respect to inspection and maintenance;
- EU countries with stricter and more comprehensive regulations may have difficulties in attracting industry to invest in new industrial installations;
- Companies which are active in several European countries need to spend additional resources in order to meet all different legal requirements. This puts them in an unfavourable economic position with respect to for example the US-industry which has a more uniform legal environment;
Small and medium sized industrial companies may not have the resources to meet all the legal requirements in the different countries. They may therefore not be able to expand their activities to other EU countries.

The CWA, for which RIMAP provides a basis, should be sufficiently flexible in being applicable to technologies currently in use as well as to technologies developed in the future. The CWA should also contribute to ensure that new technologies can be introduced in plants in a safe and cost-efficient manner.

One goal of this project is to harmonize national regulatory requirements to make the inspection and maintenance programmes more cost-efficient while safety, health, and environmental performance is maintained or improved.

The programme works toward this goal by:

- developing policies and methodologies, including risk assessment guidelines, principles of good planning practices, etc. The use of this global framework and methods by all EU countries promotes international harmonisation and facilitates equipment hazard assessment;
- providing services to help countries exchange experience and information, and to work co-operatively on the risk assessment and risk based inspection and maintenance. It will give to EU countries a forum and mechanism that will enable them to work together, discuss new developments, and increase mutual understanding about national and regional regulatory practices.

5) CEN Workshop Work Programme

The CEN Workshop for “Risk Based Inspection and Maintenance Procedures for European Industry” will facilitate the transfer of RIMAP Procedure documents (see section 1) to a CEN Workshop Agreement. This will allow all parties interested in the field to discuss and contribute to the development of the CWA.

The Kick-Off Meeting of the CEN Workshop will be open (free of charge) to any interested party willing to participate. Registration is mandatory. A registration form, as well as the draft CEN Workshop Business Plan, will be available for those willing to participate, on the CEN Management Centre Website.

Following approval of the CEN Workshop Business Plan at the Kick-Off Meeting, further interested parties wishing to join the Workshop will need to register at the CEN Workshop Secretariat before sending out draft version of the CWA. Participation is subject to acceptance of the Workshop objectives and the commitment to provide the financing as set out in section 6 below.

The CWA will be approved by the registered members, to satisfy the objectives stipulated by the Workshop. A draft of the CWA will be made available on the interactive website for public comment for 60 days, and the Workshop will take due account of any comments made. This will be done by means of the interactive web-site.

5.1 Deliverables

<table>
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<tr>
<th>Item</th>
<th>Date</th>
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<tbody>
<tr>
<td>Kick-Off Meeting</td>
<td>June 30, 2005</td>
</tr>
<tr>
<td>The deadline for unconditional registration of new partners, “registration at the Kick-Off Meeting”</td>
<td>July 8, 2005</td>
</tr>
<tr>
<td>Produce draft CWA¹</td>
<td>End of September 2005</td>
</tr>
<tr>
<td>60 days public comment phase</td>
<td>End of September 2005 – December 2005</td>
</tr>
<tr>
<td>The deadline for registration of new partners, provided the agreement of all other already registered partners</td>
<td>December 2005</td>
</tr>
<tr>
<td>Produce and send out to registered partners the final draft version of the CWA</td>
<td>end of December</td>
</tr>
<tr>
<td>Final Plenary Meeting²</td>
<td>2005/January 2006</td>
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</tbody>
</table>

¹ The CEN Workshop Agreement (CWA) will cover basic RIMAP procedure and its application, including relevant examples. Suggested title of the RIMAP CWA Document is: “Risk Based Inspection and Maintenance Procedures for European Industry”
6) CEN Workshop Structure and Resource Requirements

6.1 CEN Workshop Chairman

His responsibilities will include:

- chairing the CEN Workshop (kick off and plenary) meetings;
- representing the CEN Workshop in outside meetings in cooperation with CEN Management Centre and with the Workshop Secretariat;
- monitoring progress of the CWA.

6.2 CEN Workshop Secretariat

MSZT, the Hungarian Standards Institution, has offered to hold the workshop secretariat, therefore providing the formal link to CEN system. MSZT would be assisted in the whole operating issues of the Workshop by the RIMAP TN operating agency. It is noted that for the coordination of the RIMAP TN extension for NAS countries is coordinated by the Hungarian institute Bay Zoltan Foundation (BZF).

The following activities will be carried out by the Workshop Secretariat:

- organizing WS plenary meetings
- producing WS and project meeting reports and action lists
- administrative contact point for WS projects (if any, for now there are no projects planned)
- managing WS membership lists
- managing WS document registers
- follow-up of action lists
- if the Workshop works mainly by electronic means, assist Chairperson in monitoring and follow-up of electronic discussions

6.3 Costs and Resources

CEN Workshop Secretariat costs have been agreed as a lump sum of 9400€. These costs will be covered by the parties participating in the Workshop on the basis of the commitment at the registration.

The participation (registration) fee is fixed to 850€ per partner and will be paid directly to the Secretariat based on the contract between the Secretariat (acting on behalf of CEN) and the corresponding partner. At the final meeting reconciliation will be made according to the recommended practice of CEN. Secretariat in agreement with the Chairman and the Vice-Chairman may use possible surplus for the direct needs/benefit of the CWA and related actions also according to the recommended practice of. The partners having registered before July 8, 2005 will be considered as registered at the Kick-Off Meeting.

7) External Liaisons

7.1 Projects and Associations

There are no standards-related liaisons, but it will be necessary, through the Thematic Network, to ensure liaison with a number of individual projects and associations. The liaison does not imply participation in the consensus

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\[ Possible options for new revised versions/editions of the CWA will be examined and possible foreseen at the final meeting. \]
rights and/or any sort of partnership – if they want to become a partner they have to register. In other words, these liaisons should not however circumvent the rules of the CEN Workshop.

- **ELAPSE** Extending the economic lifetime of ageing plants by systematic engineering, EU-project-1426, BE96-3044. ELAPSE aims at improving the long term profitability of ageing plants while improving the safety, health and environmental performance. This is done by developing and implementing a methodology for risk based maintenance and refurbishment management.

- **EEMUA** - Engineering equipment and materials users association. EEMUA was formed in 1983 to “reduce costs and improve safety by sharing experience and expertise, and by promotion of distinct engineering users interests”. EEMUA is dedicated to serving the interests of industrial users. The members are major Oil Gas & Petrochemical companies, power generation, utility & transmission companies, and process and construction companies.

- **EURISK** – Risk based inspection for nuclear industry.

- **ENIQ** - European Network for Inspection validation. A network established by JRC, which contains national data on the verification of the effectiveness and performance of the inspection techniques and procedures in nuclear plants.

- **SINTAP** - Structural Integrity Assessment Procedures, EU-project BE95-1426, 1996-1999. The objective of SINTAP is the development of a structural integrity procedure for defect assessment to be used for metallic components within a wide range of European industries.

- **HIDA** - Validation, Expansion and Standardisation of Procedures for High Temperature Defect Assessment, EU-project BE-1702, 1996 - 1999. The main aims of the project are to improve and validate procedures for high temperature defect assessment and to contribute to the establishment of a European Standard.

- **SAFETYNET** is a Thematic Network on process safety, and the objectives are to:
  - discuss safety problems,
  - find out about the new ideas from the results of the world-wide effort in safety research,
  - learn of new safety technologies,
  - be offered opportunities for the analysis and resolution of specific safety problems,
  - keep abreast of new legislation and standards and how they will affect you.

- **The Process Industry Safety Management network (PRISM)** is a cluster focusing on collaborative research in the areas of:
  - Safety awareness
  - Behavioural safety change processes
  - Integration of process and behavioural safety
  - Follow-up research on effectiveness

- **In addition to the mentioned joint projects some of the partners have related internal R&D activities. Results from these will also be used whenever possible. A number of other ongoing projects and other activities have been identified using the CORDIS database. These will be contacted and the possibility for collaboration will be investigated as soon as the project starts. Promotion will also take place through the European Technology Platform on Industrial Safety.**

### Technical Committees

The following TCs (Technical Committees) are considered relevant to this CWA:

- **CEN/TC 12** - Materials, equipment and offshore structures for petroleum, petrochemical and natural gas industries
- **CEN/TC 23/SC 3** - Operational requirements DIN
- **CEN/TC 54** - Unfired pressure vessels BSI
- **CEN/TC 110** - Heat exchangers BSI
- **CEN/TC 114** - Safety of machinery DIN
- **CEN/TC 121/SC 5** - Non destructive examination AFNOR
- **CEN/TC 138** - Non-destructive testing AFNOR
- **CEN/TC 186** - Industrial thermo-processing – Safety DIN
- **CEN/TC 197/SC 1** - Safety DIN
- **CEN/TC 267** – industrial piping …
- **CEN/TC 269** - Shell and water-tube boilers DIN
- **CEN/TC 274/SC 1** - General safety requirements DIN
- **ECISS/TC 29/SC 1** - Tubes for pressure purposes UNI
- **ECISS/TC 29/SC 10** - Non-destructive testing UNI
8) Contact Points

8.1 Chair of the CEN Workshop
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2. Mr. Aleksandar, Jovanovic, MPA Stuttgart(main editor and coordinator)  
3. Mr. Robert, Kauer, TÜV Süd  
4. Mr. Michael, Renner, BAYER Technology Services  
5. Mr. Stale, Selmer-Olsen, DNV

Rights: Read, place comments, decide about the comments of others and edit the text under the coordination of the main editor.

\(^3\) List to be updated according to the applications available before July 8, 2005
8.6 **Reviewers**

All registered members and the Chairman and the secretary

On June 30, 2055 these were:

1. Mr. Jörg, Bareiß, EnBW Kraftwerke AG, Germany
2. Mr. Arie, de Bruyne, YARA, The Netherlands
3. Mr. Gilles, Deleuze, EDF R&D, France
4. Mr. Maarten, Festen, SHELL Global Solutions, The Netherlands
5. Mr. Aleksandar, Jovanovic, MPA Stuttgart, Germany
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10. Mr. Reinhard, Preiss, TÜV Austria, Austria
11. Mr. Michael, Renner, BAYER Technology Services, Germany
12. Mr. Stale, Selmer-Olsen, DNV, Norway
13. Mr. József, SZABÓ, Hungarian Standardization Organization, Hungary

Rights: Read and place comments visible to all members of the CEN WA.

8.7 **Readers**

All registered readers of the 60 days public inquiry (registration at the web site).

Rights: Read, send comments to editors and/or reviewers.

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**Annex 1: Cost structuring/planning and reporting/conciliation**

(according to the CEN recommendations)

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4 List to be updated according to the applications available before July 8, 2005
<table>
<thead>
<tr>
<th>Human Resource Costs</th>
<th>Who (NSB or name)</th>
<th>Estimated Cost (€)</th>
<th>Covered by (Whom)</th>
<th>Commitment (Y/N)</th>
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<td>e.g.:</td>
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<td>o organizing WS plenary meetings</td>
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<td>o producing WS and project meeting reports and action lists</td>
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<td>o administrative contact point for WS’s projects</td>
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<tr>
<td>o managing WS (and project group) membership lists</td>
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<td>o managing WS (and project group) document registers</td>
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<tr>
<td>o follow-up of action lists</td>
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<tr>
<td>o assist Chairperson in monitoring and follow-up of electronic discussions</td>
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<td>e.g.:</td>
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<tr>
<td></td>
<td>MSZT</td>
<td>9,400.-</td>
<td>Participation fees (850€ per partner)</td>
<td>Y</td>
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<tr>
<td><strong>WS Chairperson (Vice Chairperson)</strong></td>
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<td>e.g.:</td>
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<td>o chairing WS plenary meetings (Vice: substitute the Chair)</td>
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<td>o responsible for overall WS/ project management (Vice: assist the Chair)</td>
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<td>o producing project management progress reports (Vice: assist the Chair)</td>
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<td>o acting as formal liaison with related WS/projects and liaison body (Vice: substitute the Chair)</td>
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<tr>
<td>o follow and steer electronic discussions that take place between meetings, take necessary decisions (Vice: assist the Chair)</td>
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<td>o actions for promoting the CWA (contacts to other standardization groups, presentations at the CEN TC’s, contacts to CEN, EU, CEC, etc.)</td>
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<td>e.g.:</td>
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<td></td>
<td>MPA</td>
<td>Own cost</td>
<td>Participation fees (850€ per partner)</td>
<td>Y</td>
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<tr>
<td><strong>CWA Editors</strong></td>
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<td>o editing of the CWA texts</td>
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<td>o attend meetings as appropriate – at least the Final Meeting</td>
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<td>o follow discussions relating to the CWA that he/she is editing</td>
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<td>e.g.:</td>
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<td></td>
<td>See the list</td>
<td>Own cost</td>
<td>Own cost</td>
<td>Y</td>
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</tbody>
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