

Activities of the MDEP Working Group on Component Manufacturing Oversight

Sungho Yang
Chairman / MDEP WGCMO

RIC 2008 Track-4 New Reactors

International Activities for New Reactors

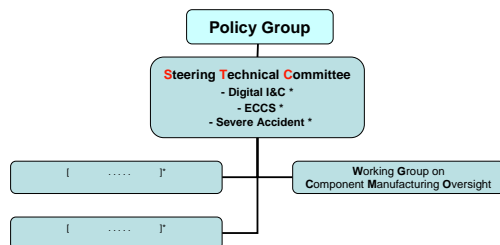
Focus of MDEP-2

Stage 2 of the MDEP is focused on enhancing cooperation amongst regulators in their review of new reactor designs, through better understanding and ultimately **convergence/harmonization of applicable codes, standards, regulations and regulatory practices**

RIC 2008 Track-4 New Reactors

International Activities for New Reactors

MDEP-2 Organization



* Expert meetings

** New design specific working groups would be established in response to international interest

RIC 2008 Track-4 New Reactors

International Activities for New Reactors

WGCMO Participants

- Canada, Finland, France, Japan, Korea, Russian Federation, South Africa, UK, US, IAEA
- NEA (Secretariat Support)

RIC 2008 Track-4 New Reactors

International Activities for New Reactors

Scope of WGCMO

The WGCMO had been given by the STC the task of

- assessing the regulatory requirements, and
- review associated with the manufacture processes for components for use in nuclear power plants.

RIC 2008 Track-4 New Reactors

International Activities for New Reactors

Activity List

- 1st MEETING:** Objectives / Focus / Survey Questions / Work Plan
- SURVEY:** Codes & Standards / QA/QC / Inspections for Highest Safety Pumps/Valves/Piping/Pressure Vessels
- 2nd MEETING:** Open Meeting with Code bodies and Vendors / Survey Presentations / Supplementary Survey Questions / Site Visit – AREVA
- SURVEY:** 13 Questions related with the Regulatory Framework
- 3rd MEETING:** Open Meeting with Code bodies and Vendors / Survey Presentations and Discussion / Site Visits – DOOSAN, MHI & JSW
- REPORT:** Observations and Conclusions
- 4th MEETING:** Report Finalization
- PLANNING:** Implementation Plan of STC Recommendations
- 5th MEETING:** Discussion with code bodies on reconciliation

RIC 2008 Track-4 New Reactors

International Activities for New Reactors

Summary of Activities

1st MEETING – NEA – Oct 2006

- Based on discussion, in addressing the subject given by the STC, the working group focused its attention on the design and manufacturing processes for the highest safety class components.
- To facilitate completing the task within one year, the working group limited the scope of its studies to mechanical components; e.g., pumps, valves, piping, and pressure vessels.
- Based on discussion, the working group focused its review on the use of;
 - codes and standards,
 - quality assurance / management programmes, and
 - inspection programmes by the manufacturer, designated third party inspection agency and the regulatory authority.

RIC 2008 Track-4 New Reactors

International Activities for New Reactors

Summary of Activities

2nd MEETING – NEA – Feb 2007

- The working group invited code organizations to make presentations of their codes and standards used in Canada, France, Korea, the Russian Federation and the US.
- Based on presentation and discussion, the working group derived additional survey questions to understand the degree of differences in codes and standards, technical criteria, quality assurance, independent inspections and accreditation.
(e.g.) - What criteria does the regulator use to assess adequacy of the pressure boundary components?
 - Does the regulator specify a QA standard?
- Additionally, the group optionally visited Areva Chalon Plant to survey a practice of the vendor applying multiple codes and standards.

RIC 2008 Track-4 New Reactors

International Activities for New Reactors

Summary of Activities

3rd MEETING – Busan, Korea – May 2007

- The working group invited code organizations to make presentations of their codes and standards in use for component manufacturing: AFCEN/RCC-M, JSME, KEA/KEPIC and ASME.
- Based on open discussion with code representatives, the working group observed necessity for reconciling codes and standards.
- Based on code presentations and discussion on survey results, the working group made observations and came to conclusions.
- Based on the lessons learned from the first site visit, the working group optionally visited Asian vendor facilities;
 - Doosan, Changwon Plant, Korea,
 - Mitsubishi, Kobe Plant, Japan, and
 - Japan Steel Works, Muroran Plant, Japan.

RIC 2008 Track-4 New Reactors

International Activities for New Reactors

Summary of Activities

REPORT PREPARATION

- Based on discussion at the 3rd meeting, the working group prepared a draft report and circulated for members review.
- The main sections of the draft report covered observations of:
 - (1) codes and standards;
 - (2) QA / QM;
 - (3) regulatory requirements;
 - (4) manufacturing site visits, andConclusions

4th MEETING – Dijon, France – Aug 2007

- The working group met and finalized the draft report.

RIC 2008 Track-4 New Reactors

International Activities for New Reactors

Observations

CODES AND STANDARDS (1/2)

- Regulatory requirements related to design and manufacturing codes differ significantly from country to country, ranging from quite specific requirements to those that require the applicant to specify and justify methods to be followed.
- Differences in codes and regulatory requirements and practices from the various countries seeking to construct new plants may require some adjustment by the component manufacturers to their manufacturing oversight programs, particularly related to inspections and audits conducted during component manufacture. Reconciling these can be difficult for manufacturers.

RIC 2008 Track-4 New Reactors

International Activities for New Reactors

Observations

CODES AND STANDARDS (2/2)

- ASME, CSA, JSME, KEPIC and RCC-M are not fundamentally different.
- RCC-M generally addresses issues that ASME, KEPIC and JSME would leave to the operator to address (e.g., corrosion, thermal aging for long term operation, and cobalt content in materials, as it relates to coolant system contamination).
- Components designed and / or manufactured to codes not normally used in a country may be considered as "fit for service" in that country with the performance of additional analysis or testing, acceptable to the regulatory authority.

RIC 2008 Track-4 New Reactors

International Activities for New Reactors

Observations

QUALITY ASSURANCE / MANAGEMENT

- ISO-9001 is used broadly across many industries and whilst it does not provide all the elements expected relating to the safety of nuclear power plants.
- ASME/NQA-1 provides detailed elements that, when used within this structure, result in a more comprehensive approach.
- Quality assurance / management requirements are not an impediment to the goals of MDEP.
 - ISO 9001 and IAEA based QM system approaches can be used to provide an overall quality assurance / management program structure.
 - ASME NQA-1 can provide additional quality requirements specifically focused on nuclear power plants.

RIC 2008 Track-4 New Reactors

International Activities for New Reactors

Observations

REGULATORY REQUIREMENTS (1/3)

- To a large extent, the level of difficulty depends on the origin of the regulatory requirements: in law, in regulatory documents or in regulatory or industry practices.
- In a few countries, the use of specific codes and standards is embedded in law, and this aspect presents a significant barrier to harmonization of regulatory requirements.
- However, in some countries, the use of specific codes and standards is specified in regulatory documents. It is possible to use alternative codes and standards to those specified in regulatory documents provided that these are fully justified, by the intended user, to the regulatory authorities. Thus the difference in regulatory requirements specifying design codes and standards, while difficult, is not seen as an impediment to the goals of MDEP.

RIC 2008 Track-4 New Reactors

International Activities for New Reactors

Observations

REGULATORY REQUIREMENTS (2/3)

- Independent inspection during differ from country to country, ranging from specifying third party inspections in the regulatory documents to be carried out, to requiring it by endorsing ASME or equivalent code in the regulatory documents, or to leaving it to the utility or vendor's arrangement. The effective use of third party inspections depends, to a high degree, on national nuclear infrastructures, which vary from country to country.
- Regulatory requirements related to personal accreditation vary significantly from country to country. A number of regulators require specific accreditation of professional engineers and NDE personnel as part of the design and manufacturing requirements, whilst others require those personnel are suitably qualified and experienced.

RIC 2008 Track-4 New Reactors

International Activities for New Reactors

Observations

REGULATORY REQUIREMENTS (3/3)

- Regulatory inspection practices differ among countries seeking to construct new plants. Some regulators carry out physical inspections in the vendor's facility, others may witness/monitor inspections carried out by the vendor and/or the licensee and/or by an independent inspection body.
- In conclusion, it appears there is an opportunity for convergence and harmonization of regulatory requirements if the regulatory bodies agree to cooperatively develop and adopt a common approach.

RIC 2008 Track-4 New Reactors

International Activities for New Reactors

Observations

MANUFACTURING SITE VISITS (1/3)

- The four vendors were accustomed to working to the different design codes and standards.
- However, the similarity of the codes gives some promise that an effort to bring the code bodies together to reconcile the requirements of ASME, JSME, KEPIC and RCC-M would be productive.
 - KEPIC is consistent with ASME Section III in technical requirements.
 - JSME is similar to ASME Section III in technical requirements with some notable differences (e.g., having lower allowable stresses for the same materials).
 - RCC-M was derived from ASME Section III in the early 1980s and has diverged from ASME in certain areas, although it is also similar to ASME Section III but, perhaps to a lesser extent than the JSME and KEPIC.

RIC 2008 Track-4 New Reactors

International Activities for New Reactors

Observations

MANUFACTURING SITE VISITS (2/3)

- Differences in administrative requirements among ASME, JSME, KEPIC and RCC-M.
 - ASME contains a requirement (per the code) that a registered professional engineer must validate the design specification and design report.
 - The United States, Canada, South Africa and Korea have this system, while Japan, France and other countries participating in MDEP have alternative systems.
 - During the visits other differences in manufacturing codes were observed, including qualification for NDE personnel, the use of independent inspection, and material requirements.

RIC 2008 Track-4 New Reactors

International Activities for New Reactors

Observations

MANUFACTURING SITE VISITS (3/3)

- While there are differences between codes and standards used by the MDEP participating countries, the codes are quite similar, most deriving from ASME Section III. Therefore, it may be possible to reconcile some of these differences.
- The working group was concerned that having components designed to different codes and standards in production simultaneously; this would increase the potential for errors.
- The vendors were strongly in favour of migrating to a single design code and quality assurance standard and, as well as improving the component quality and safety, from their perspective would tend to reduce costs and shorten production times.

RIC 2008 Track-4 New Reactors

International Activities for New Reactors

Conclusions

- Laws, regulatory requirements and practices, design and manufacturing codes, and quality standards related to high safety class pressure boundary components differ from country to country, however the overall systems to ensure safety are basically similar.
- The various design codes and standards are not fundamentally different, although their scope may differ. Further convergence by the code organisations could be beneficial but would require substantial effort. Initially, it would be beneficial to establish a retrievable data base of the differences. The Russian Federation is prepared to participate in further comparisons of their requirements with other codes and standards such as ASME, RCC-M, JSME, CSA and KEPIC.

RIC 2008 Track-4 New Reactors

International Activities for New Reactors

Conclusions

- For the design and manufacture of pressure boundary components adherence to design codes and standards is a minimum requirement in showing adequacy. Additional country specific criteria would also need to be satisfied. Convergence of requirements and criteria by regulators may be difficult.
- Regulatory requirements related to QA / QM differ significantly, however future convergence is considered feasible.
- All regulators require minimum levels of competence of design and inspection personnel to be demonstrated, therefore, convergence to a universal system may be problematic.
- Component manufacturers are currently subject to multiple inspections and audits similar in scope but conducted by different organisations.

RIC 2008 Track-4 New Reactors

International Activities for New Reactors

Conclusions

- For improved effectiveness and efficiency in the regulatory assessment of highest safety class components, one possibility would be the formation of multi-national regulatory teams to perform vendor inspections. Regulators with unique requirements could inspect their areas of special interest and share the inspection burden in reviewing the common areas. This approach using a multi-national auditing or inspection team may also be viable for the nuclear power plant owners, similar to the NUPIC process in the United States.
- These conclusions are applicable to all highest safety class pressure boundary components (pumps, valves, piping and pressure vessels).

RIC 2008 Track-4 New Reactors

International Activities for New Reactors

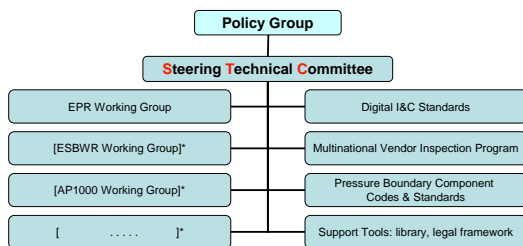
STC Recommendation

- Undertake a multinational vendor inspection program
- Complete the evaluation of the similarities and differences among codes and standards for pressure boundary components

RIC 2008 Track-4 New Reactors

International Activities for New Reactors

MDEP-2 Organization (Revised)



* New design specific working groups would be established in response to international interest

RIC 2008 Track-4 New Reactors

International Activities for New Reactors
