MULTINATIONAL DESIGN EVALUATION PROGRAMME

ANNUAL REPORT

MARCH 2011 – MARCH 2012

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AEN NEA

NUCLEAR ENERGY AGENCY

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FOREWORD FROM THE POLICY GROUP CHAIRMAN

Paris, 22 May 2012

On 11 March 2011, the Fukushima Daiichi accident, triggered by an earthquake and a tsunami on an exceptional scale, confirms that, despite any precaution taken in the design, construction and operation of nuclear reactors, an accident can never be completely ruled out. These tragic events understandably shined a brighter spotlight on the safety of nuclear power plants (NPPs) worldwide, both for operating and new NPPs and the need to strengthen international co-operation.

Since its creation in 2006, the Multinational Design Evaluation Programme (MDEP) has been devoted to harmonising and improving safety objectives for every new design. The main goal of this multinational initiative is to leverage the resources and knowledge of national regulatory authorities who are, or will shortly be, undertaking the review of new reactor power plant designs. The original ten MDEP members are regulators from following countries: Canada, China, Finland, France, Japan, Korea, the Russian Federation, South Africa, the United Kingdom and the United States. In addition to these original members, the national regulator for India, the Atomic Energy Regulatory Board (AERB), has recently been accepted as an MDEP member becoming the first new member in MDEP since its inception in 2006. As a full member, AERB will contribute to MDEP's strategic decisions taken within the Policy Group (PG), which comprises the heads of all national regulators involved in the programme and participate in the implementation of these guidance by the Steering Technical Committee (STC) which directs the various MDEP's working groups such as the two design-specific and three issue-specific working groups.

Pooling the resources of these 11 nuclear regulatory authorities, MDEP incorporates a broad range of activities including enhancing multilateral co-operation within existing regulatory frameworks, and increasing multinational convergence of codes, standards, guides, practises and safety goals. Working groups are implementing the activities in accordance with programme plans with specific activities and goals, and have established the necessary interfaces both within and outside of MDEP members. All reports and guidance documents issued in the frame of this programme are shared internationally beyond MDEP membership.

It has to be stressed that various other organisations are involved in MDEP programme such as IAEA and the OECD Nuclear Energy Agency (NEA), which performs the Technical Secretariat function. MDEP also encourages the strengthening of sustainable exchanges with utilities and others concerned organisations.

In order to assess the progress that MDEP has made towards achieving its goals, a programmatic self-assessment was initiated by the STC in September 2011, soliciting input from both MDEP members and external stakeholders. Initial results indicate that MDEP is meeting the objectives of the programme and recommendations for improvements will be considered in setting future programme direction.

Significant progress is being made on the overall MDEP goals and, in addition, the lessons learnt from 11 March 2011, events at the Fukushima Daiichi nuclear power plant are being appropriately incorporated into MDEP activities such as considering extreme events including floods, earthquake or total loss of electrical supply.

So far, two design-specific working groups, dedicated to AP1000 and EPR designs, are facilitating MDEP programme goal of enhanced co-operation. These groups have the common goal to share information and experience on the safety design reviews with the purpose of enhancing the safety of the design and enabling regulators to make timely licensing decisions, and of promoting safety and standardisation of designs.

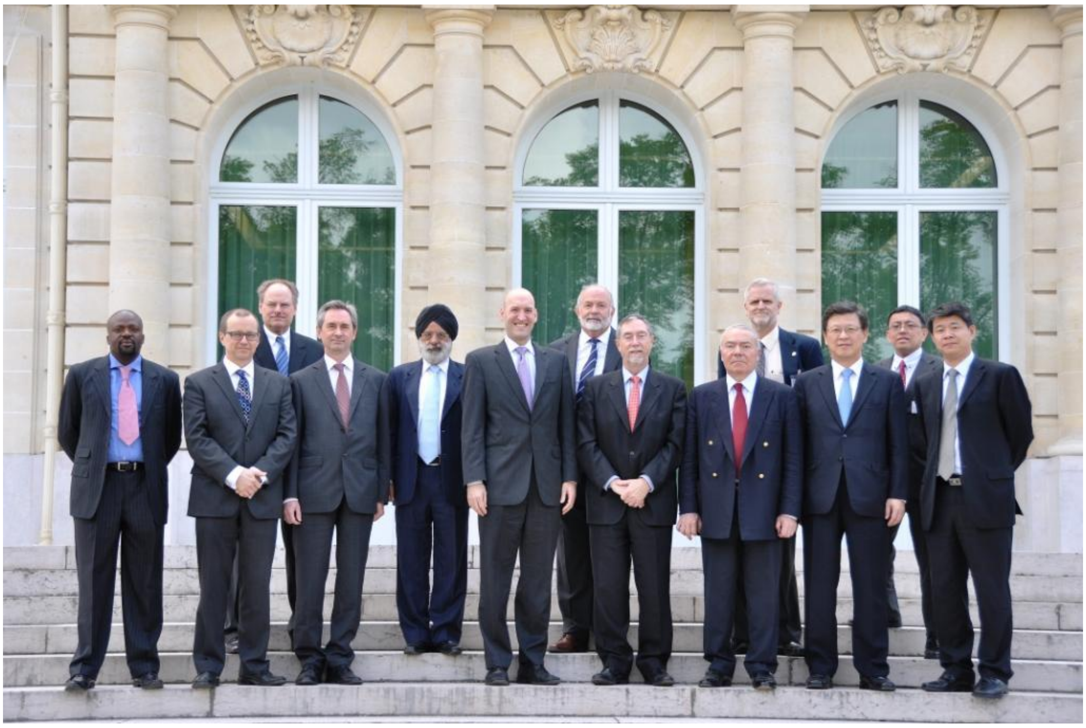
Fruitful co-operation is also carried out in the frame of issue-specific working groups charged with studying the similarities and differences in regulatory requirements and practises in generic safety areas. As an example, seven witnessed and joint inspections have been conducted during the past year in the frame of the Vendor Inspection Co-operation Working Group (VICWG) and several common positions have been issued by the Digital Instrumentation and Controls Working Group (DICWG) (verification and validation practises and safety and security interface). Another main achievement was the completion of an evaluation of a pressure vessel codes comparison performed by the Standards Development Organisations.

MDEP organised the second Conference on New Reactor Design Activities on 15-16 September 2011 in Paris. More than 120 persons attended the conference representing 23 national regulators along with technical support organisations, multinational organisations such as the IAEA, WENRA, WANO, major reactor vendors and mechanical and electrical Standards Development Organisations. This event has been a unique opportunity to share and discuss MDEP outcomes and to improve our own work by taking into account the main findings of this conference. It has already been decided to organise a new conference in 2013.

All MDEP accomplishments in 2011, as well as significant work completed in early 2012, presented in detail in the present report provide confidence that MDEP membership, structure and processes provide an effective method of accomplishing increased co-operation in regulatory design reviews.

In 2012 and in the coming years, MDEP will have to maintain its high-level expertise exchange capacity and at the same time face several challenges. A first one is to take into account the full experience feedback of the Fukushima accident and to promote an appropriate co-operation with all stakeholders including the IAEA, national regulators and operators. A key challenge for MDEP programme lies also in the integration of new members as India’s AERB, and ensuring that all members (full or associated) remain fully involved in the programme, enabling to achieve further remarkable achievements. The fact that other regulators have already expressed their interest to join MDEP is proof of the dynamism of this initiative.

André-Claude LACOSTE
MDEP Policy Group Chairman



May 2012 – MDEP Policy Group meeting

EXECUTIVE SUMMARY

The Multinational Design Evaluation Programme (MDEP) is a multinational initiative to leverage the resources and knowledge of national regulatory authorities who are, or will shortly be, undertaking the review of new reactor power plant designs. The original ten MDEP member countries are: Canada, China, Finland, France, Japan, Korea, the Russian Federation, South Africa, the United Kingdom and the United States. In addition to these original members, the national regulator for India, the Atomic Energy Regulatory Board (AERB) has recently been accepted as an MDEP member. The IAEA also takes part in the work of MDEP and the OECD Nuclear Energy Agency (NEA) performs the Technical Secretariat function in support of MDEP. MDEP incorporates a broad range of activities including enhancing multilateral co-operation within existing regulatory frameworks, and increasing multinational convergence of codes, standards, guides, and safety goals. A key concept throughout the work of MDEP is that national regulators retain sovereign authority for all licensing and regulatory decisions.

The programme of work consists of activities which were chosen because they could be accomplished in the near term, are relevant to new reactor evaluations and would result in significant benefits while requiring minimum resources. Working groups are implementing the activities in accordance with programme plans with specific activities and goals, and have established the necessary interfaces both within and outside of MDEP members. In January 2011, additional levels of MDEP membership were approved: MDEP associate members will be national regulatory authorities without previous licensing experience, invited to participate in selected MDEP design-specific activities; MDEP candidates will be countries that have an experienced nuclear regulatory organisation and have mid- to long-term plans to pursue new reactor licensing and construction. This report provides a status of the programme after its fourth year of implementation.

Significant progress is being made on the overall MDEP goals of increased co-operation and enhanced convergence of requirements and practices. In addition, the lessons learnt from the 11 March 2011, events at the Fukushima Daiichi nuclear power plant are being appropriately incorporated into MDEP activities.

In order to assess the progress that MDEP has made towards achieving its goals, a programmatic self-assessment was initiated in September 2011. Input was solicited from both MDEP members and external stakeholders. Initial results indicate that MDEP is meeting the objectives of the programme and recommendations for improvement will be considered in setting future programme direction.

Two design-specific working groups are facilitating MDEP programme goal of enhanced co-operation. The EPR Working Group (EPRWG) consists of the regulatory authorities of France, Finland, US, UK, China, and Canada. The EPRWG has been successful in sharing information and experience on the safety design reviews of the EPR with the purposes of enhancing the safety of the design and enabling regulators to make timely licensing decisions, and of promoting safety and standardisation of designs through MDEP co-operation. Four expert subgroups are currently interacting on specific technical issues and additional topics have been proposed. The AP1000 Design-specific Working Group consists of the regulatory authorities of Canada, China, United Kingdom, and the United States. Three expert subgroups addressed the areas of control rod drive mechanisms, civil engineering, and squib valves.

The Vendor Inspection Co-operation Working Group (VICWG) has achieved its short-term goals and continues to focus on maximising information sharing, joint inspections (multiple regulators inspecting to the regulatory requirements of one country), and witnessing of other regulators' inspections. A total of seven witnessed and joint inspections were conducted pursuant to VICWG activities in 2011. The VICWG will also work with standards development organisations (SDOs)to encourage and explore harmonisation of quality standards. The working group continues to make progress towards achieving its long-term program goals to harmonise a significant portion of the quality assurance inspection procedures so that the results of an inspection conducted by one member could be used by the other members.

The Digital Instrumentation and Controls Working Group (DICWG) has identified 12 topics for which it will pursue the development of common positions based on the existing standards, national regulatory guidance, best practices, and group inputs using an agreed upon process and framework. To date, the working group has published five common positions on software tools, communication independence, simplicity in design, verification and validation and safety and security interface. In 2011, the group finalised the latter two common positions. Those common positions have been made publicly available on MDEP website. The DICWG is enhancing its co-operation with the standards organisations, the Institute of Electrical and Electronics Engineers (IEEE) and the International Electrotechnical Commission (IEC). In addition, the DICWG members jointly research and comment on proposed IEC, IEEE, and IAEA standards that are relevant to the regulatory review of digital I&C systems.

The Codes and Standards Working Group (CSWG) has completed an evaluation of the code comparison performed by the standards development organisations (SDOs). The SDOs, with the encouragement and support of the working group, compared the Class 1 pressure vessel codes and developed a database that identified the similarities and differences between the Canadian, Korean, Japanese, and French codes, and the ASME code. The CSWG works closely with the SDOs to converge code requirements and reconcile code differences. The CSWG also developed several work products separate from the SDOs code comparison activity.

This report provides information on MDEP accomplishments in 2011 as well as significant work completed in early 2012. Accomplishments to date provide confidence that MDEP membership, structure and processes provide an effective method of accomplishing increased co-operation in regulatory design reviews. The interim results include:

- Drafting common positions on the evaluation of containment circulation and mixing, and mass and energy releases in containment for the EPR;
- Co-operating on six witnessed vendor inspections and one joint vendor inspection;
- Updating and finalising a comparison survey on quality assurance requirements used in the oversight of vendors;
- Interacting with the mechanical standards development organisations (SDOs) to complete and issue a comparison report including tables of the ASME's Boiler and Pressure Vessel Code, AFCEN's RCCM Code, JSME S NC1, CSA's Code, and KEPIC's code for Class 1 pressure vessels, piping, pumps, and valves;
- Identifying a complete list of 12 technical issues in the area of digital instrumentation and control that will be pursued by MDEP for the development of common positions;
- Finalising common positions, on verification and validation throughout the life cycle of digital safety systems, and on the impact of cyber security features on digital instrumentation and control safety systems;
- Drafting a report "Fundamental Attributes of Mechanical Codes" that establishes high-level requirements or fundamental concepts for codes and standards. Drafting "Essential Performance Guidelines" and a "Description of MDEP Regulators' Practices in Using Mechanical Codes and Standards."
- Successful conduct of the Second MDEP Conference on New Reactor Design Activities held 15–16 September 2011 in Paris. This event helped communicate MDEP activities and other issues to many of the external stakeholders.

MULTINATIONAL DESIGN EVALUATION PROGRAMME

1. INTRODUCTION

The Multinational Design Evaluation Programme (MDEP) is a multinational initiative that develops innovative approaches to leverage the resources and knowledge of national regulatory authorities who are, or will shortly be, undertaking the review of new reactor power plant designs. MDEP has evolved from primarily a design evaluation program to a multinational co-operation program that includes inspection activities and generic issues.

A key concept throughout the programme is that MDEP will better inform the decisions of regulatory authorities through multinational co-operation, while retaining the sovereign authority of each regulator to make licensing and regulatory decisions.

The idea for the programme was initiated in 2005, and a planning meeting of the original 10 participating countries and IAEA was held in June 2006. Initial efforts consisted of multilateral co-operation on the European Pressurised Water Reactor (EPR) design reviews, and a pilot project to assess the feasibility of enhancing multinational co-operation and convergence of codes, standards, and safety goals within existing regulatory frameworks. The multilateral co-operation on the EPR expanded on bilateral interactions that had already been established between France and Finland. In March 2008, the Policy Group (PG) that oversees the programme approved the structure for MDEP consisting of the Policy Group and the Steering Technical Committee that implements the programme with issue specific and design specific Working Groups. The Organisation for Co-operation and Development's (OECD) Nuclear Energy Agency (NEA) serves as the technical secretariat. In addition the IAEA takes part in the work of MDEP. In March 2009, the Policy Group approved MDEP as a long term programme that should focus on interim results.

The programme of work consists of activities which were chosen because they could be accomplished in the near term, and would result in significant benefits while requiring minimum resources. Working groups are implementing the activities in accordance with programme plans with specific activities and goals, and have established the necessary interfaces both within and outside of MDEP members. Significant progress has been made over the past year on the overall MDEP goals of increased co-operation and enhanced convergence of requirements and practices. Accomplishments to date provide confidence that MDEP membership, structure and process provide an effective method of accomplishing increased co-operation in regulatory design reviews. The progress that has already been achieved demonstrates that a broader level of co-operation and convergence is both possible and desirable.

This report provides a status of the programme after its fourth year of implementation in 2011 and significant events in early 2012.

2. PROGRAMME GOALS AND OUTCOMES

The main objectives of MDEP effort are to enable increased co-operation and establish mutually agreed upon practices to enhance the safety of new reactor designs. The enhanced co-operation among regulators will improve the effectiveness and efficiency of the regulatory design reviews, which are part of each country's licensing process. The programme focuses on co-operation and convergence of regulatory practices that will lead to convergence of regulatory requirements. Co-operation will allow a better understanding of each other's processes to encourage and facilitate eventual convergence. The goal of MDEP is not to independently develop new regulatory standards, but to build upon the similarities already existing, and existing harmonisation in the form of IAEA and other safety standards. In addition, the common positions developed in MDEP will be shared with the IAEA for consideration in the IAEA standards development programme.

MDEP is meeting its goal of enabling increased co-operation through the activities of the working groups. MDEP has been very successful in providing a forum for regulatory bodies to co-operate on design evaluations and inspections. In addition to organising working groups, MDEP has provided each regulator with peer contacts who share information, discuss issues informally, and disseminate information rapidly. For example, the Design-specific

Working Group members have benefitted significantly from the sharing of questions among the regulators, resulting in more informed, and harmonised, regulatory decisions. MDEP members have also been highly successful in co-ordinating vendor inspections in which the regulators share observations and insights. MDEP has made improvements in communicating information regarding the members' regulatory practices through development of an MDEP Library which serves as a central repository for all documents associated with the programme.

MDEP is meeting its goal of convergence of regulatory practices by establishing common positions in both the issue-specific and design-specific working groups. The working groups are making comparisons of the regulatory practices in the member countries, identifying differences, and developing common positions. The working groups are also working with codes and standards organisations to identify differences and propose areas of convergence.

Progress towards harmonised regulatory practices and requirements for Generation IV reactor designs will be a natural outgrowth of this programme, as the participating regulatory authorities find that multinational co-operation and convergence of regulatory practices become routine elements of their planning and execution of new design evaluations. It is noteworthy that nine of the 11 MDEP member countries are also members of the Generation IV International Forum (GIF).

MDEP has been successful in meeting the expected outcomes as defined in MDEP (TORs) by: increasing knowledge transfer, identifying similarities and differences in the regulatory practices; increasing stakeholders' understanding of regulatory practices; and enhancing the ability of regulatory bodies to co-operate in reactor design evaluations, vendor inspections, and construction oversight, leading to more efficient and more safety-focused regulatory decisions.

The events of 11 March 2011, at the Fukushima Daiichi nuclear power plant further highlight the need to continue this effort, and the lessons learnt from Fukushima are being appropriately incorporated into MDEP activities.

3. SELF-ASSESSMENT

In order to assess the progress that MDEP has made towards achieving its goals of enhancing the safety of new reactor design reviews and promoting the harmonisation of regulatory requirements, a programmatic self-assessment was initiated in September 2011. The goal of the self-assessment was to evaluate if MDEP activities are meeting the goals of each stakeholder, and to identify improvements and adjustments to current and future MDEP activities. Input was solicited from both MDEP members and external stakeholders to get a comprehensive picture of stakeholders' views. The survey responses indicated that MDEP members view MDEP as a unique and useful forum to connect with experts from other regulators. MDEP members strongly agreed that MDEP is meeting the goals and outcomes stated in the Terms of Reference (TOR), and both internal and external stakeholders believe that the most effective aspect of MDEP is the co-operation and exchange of information it facilitates for design reviews. Based on survey responses, MDEP will develop recommendations to address issues such as the goals and scope of the program, internal and external communications, the future of the current working groups, and potential new topics to be addressed. The results of the self-assessment will be considered by the MDEP Policy Group (PG) in setting future programme direction and implementation guidance.

4. PROGRAMME IMPLEMENTATION

4.1 Membership

Participation in the Policy Group (PG) and Steering Technical Committee (STC) is intended for mature, experienced national safety authorities of interested countries that already have commitments for new build or firm plans to have commitments in the near future for new reactor designs. Original MDEP members are: Canada, China, Finland, France, Japan, Korea, the Russian Federation, South Africa, the United Kingdom and the United States. In addition the IAEA takes part in the work of MDEP. The Policy Group has discussed the potential expansion of MDEP membership. Several national regulatory authorities have expressed interest in joining MDEP. In June 2011, MDEP Policy Group discussed a proposal for the Indian nuclear regulator to join MDEP as a full member. In order to fully inform the PG decision on this issue, the Indian regulator (AERB) documented how they address the criteria to be considered for assessing prospective MDEP membership and full membership was confirmed by the PG in early 2012.

In January 2011, MDEP Policy Group (PG)approved additional levels of MDEP membership. MDEP associate member will be a national regulatory authority without previous licensing experience that has been invited by the MDEP Policy Group to participate in selected MDEP design-specific activities based on evidence that the organisation is actively involved in new reactor design review activities relevant to MDEP. Such a regulatory authority would be from a country that has taken a firm commitment in the near term to proceed with safety design review activities, has proprietary agreements with the vendor, and is willing and ready to contribute to specific MDEP activities. It is expected that the associate member would be in a position to exchange information with MDEP members to enhance information sharing and experience in relevant design safety reviews.

The MDEP Policy Group (PG) also recognises that there are other national regulatory authorities that may also benefit from close interaction with MDEP. For example, there are several countries that have an experienced nuclear regulatory organisation, are already regulating nuclear power plants and also have mid- to long-term plans to pursue new reactor licensing and construction. Such regulators could clearly benefit from interacting now with MDEP and, in the near future, could be clear candidates to become MDEP members or associate members. It is, therefore, the intent to invite some experienced regulators to become MDEP candidates with the purpose of these organisations benefiting from the issue-specific and generic aspects of MDEP.

4.2 Organisational structure

The programme is governed by a Policy Group (PG), made up of the heads of the participating organisations, and implemented by a Steering Technical Committee (STC) and its working groups. The STC consists of senior staff representatives from each of the participating national safety authorities, including a representative from the International Atomic Energy Agency (IAEA).

The Policy Group (PG) provides guidance to the Steering Technical Committee (STC) on the overall approach, monitors the progress of the programme and determines participation in the programme.

The Steering Technical Committee (STC) manages and approves the detailed programme of work including: defining topics and working methods, establishing technical working groups, and nomination of experts; approving procedures and technical papers developed by the working groups; establishing interfaces with other international efforts to benefit from available work and avoid duplication; developing procedures for the handling of information to be shared in the project; reporting to the Policy Group (PG); identifying new topics for the programme to address; and establishing subcommittees of the STC to study specific topics.

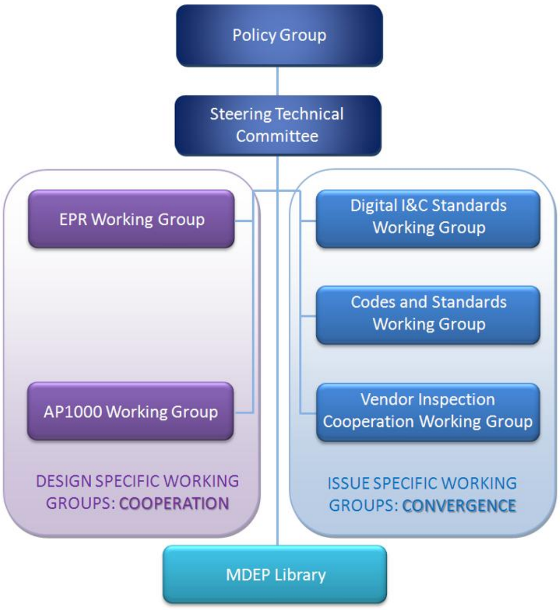
The OECD Nuclear Energy Agency (NEA) performs the technical secretariat function in support of MDEP.

Two lines of activities have been established to carry out the work.

- **Design-specific activities**. Working groups for each new reactor design share information on a timely basis and co-operate on specific reactor design evaluations and construction oversight. Participants in these working groups are the regulatory authorities that are actively reviewing, preparing to review, or constructing the specific reactor design. A design-specific working group is formed when three or more MDEP member countries express interest in working together. An “Observer” level of engagement is available for MDEP regulatory bodies engaged in regulatory action based on interest expressed by governmental authority and/or by a utility for exploring the potential for licensing new nuclear power plants of certain designs. Observers can participate in the meetings as long as appropriate controls regarding the use and discussion of proprietary information are established. This status is temporary with expectations that circumstances and the necessary agreements that will allow full participation will develop in a short time period. Under the design-specific working groups, expert subgroups have been formed to address specific technical issues.

- **Issue-specific activities.** Working groups are organised for the technical and regulatory process areas within the programme of work. These currently include, but are not limited to, vendor inspections, pressure boundary component codes and standards, and digital I&C standards. Membership in issue-specific working groups is open to all MDEP participating countries and the IAEA representatives.

The chart below illustrates how the programme is organised.



4.3 MDEP Library

MDEP information is communicated among the members through the MDEP Library which serves as a central repository for all documents associated with the programme. The NEA provides technical support for development and maintenance of the MDEP Library on a website. The website includes a folder structure and provides for two levels of access which are password protected: (1) MDEP member countries, and (2) member countries participating in design-specific working groups. Access to the library is based on requests by the STC member for each participating country and generally consists of the STC members and members of the working groups. Publicly available documents related to MDEP are available on the MDEP page of the NEA website. The STC, through the secretariat, will continue to add documents and make enhancements to improve the effectiveness of the library.

In order for MDEP to be successful at fulfilling its goal of leveraging the work of peer regulators in the licensing of new nuclear power plant designs, a framework was developed to facilitate the sharing of technical information among MDEP participants, which at times may include the sharing of proprietary and other types of sensitive information. As a general rule, the information exchanged as part of MDEP in meetings and the MDEP Library is for the sole use of participating national regulators. The members of the design-specific working groups also have a communication protocol to share MDEP positions on topics with other members in advance of release of this information into the public domain. A large portion of the information shared may not be proprietary or sensitive; however, all participating members must protect and properly handle the information that an originator claims to be proprietary or sensitive.

5. INTERACTIONS WITH OTHER ORGANISATIONS

MDEP recognises that other organisations are implementing programmes to facilitate international co-operation on new reactors. Because of MDEP's limited membership, these other avenues should be available to countries who are interested in new build, but do not meet the criteria for entrance to MDEP. MDEP strives to maintain an awareness of, and interactions with these other groups to ensure that it does not duplicate efforts, to benefit from the results of these activities, and to communicate MDEP activities and results to other organisations. To ensure that efforts are not duplicated among the groups, MDEP's scope is focused on short-term activities related to specific design reviews being conducted by the member countries, and efforts to harmonise specific regulatory practices and standards.

5.1 NEA Committee on Nuclear Regulatory Activities (CNRA)

The CNRA Working Group on the Regulation of New Reactors (WGRNR) examines the regulatory issues of siting, licensing and regulatory oversight of Generation III+ and Generation IV nuclear reactors. The current focus areas of the WGRNR are construction experience and siting issues. The WGRNR co-ordinates its work with the work performed by MDEP such that it utilises its outputs and does not duplicate its efforts, and extends the results of MDEP to other CNRA members. MDEP interacts with the CNRA WGRNR and Working Group on Inspection Practices (WGIP) through the NEA staff who also serve as the technical secretariat for the CNRA. In addition, the chairs of CNRA WGRNR and MDEP STC meet frequently to discuss on-going activities and plans. WGRNR is the focal point of interactions between MDEP and the CNRA and its working groups, and will assist in co-ordinating communications and requests between the two activities.

5.2 International Atomic Energy Agency (IAEA)

The IAEA participates in the work of MDEP through participation in the Policy Group (PG) STC meetings, and issue-specific working groups. In addition, the Generic Common Positions developed in MDEP will be shared with the IAEA for consideration in the IAEA standards development programme.

5.3 Second MDEP Conference on New Reactor Design Activities

In an effort to communicate MDEP activities to important external stakeholders, MDEP conducted the Second MDEP Conference on New Reactor Design Activities 15-16 September 2011 at the OECD headquarters in Paris. The status of MDEP working groups was discussed as well as the Fukushima accident and industry initiatives on new reactor designs. Over 120 persons attended the conference representing 23 national regulators and technical support organisations, multiple multinational organisations such as the IAEA, WENRA, WANO, EUR, Foratom-ENISS, WNA, major reactor vendors, and mechanical and electrical standards development organisations.

In his summary of the MDEP Conference, the Policy Group (PG) Chair highlighted the expected outcomes that are being met by MDEP including improving the effectiveness and efficiency of regulatory design reviews, increasing safety assessment quality and the safey level of new reactors, and facilitating convergence of regulatory requirements. This is being accomplished because MDEP is an effective and efficient network of regulatory and technical experts from different countries – a network that has undertaken a comprehensive programme of work, published useful products, and seeks input from industry stakeholders, when appropriate.

Challenges include the inherently long process of convergence of regulatory practices due to establishing national norms and legal issues. The self-assessment which was undertaken by the Steering Technical Committee (STC) should address some of these challenges.

MDEP is also a very efficient forum to discuss important emerging issues such as those related to lessons learnt from the Fukushima accident, although MDEP will not take the lead on such issues. The MDEP design-specific working groups can discuss these relevant issues for the AP1000 and EPR.

Potential membership expansion will be considered as appropriate to ensure the safety of the world's new nuclear fleet.

5.4 Interactions with industry groups

The MDEP working groups are very interested in understanding the perspectives of the design vendors, codes and standards organisations, and component manufacturers in MDEP activities, and the challenges they face in dealing with numerous regulators and regulatory systems. The MDEP working groups interact with, and invite industry groups to participate in, selective portions of meetings and other activities. For example:

- The Codes and Standards Working Group (CSWG) interacted with a committee of Standards Development Organisations (SDOs) (ASME, JSME, KEPIC, AFCEN, and CSA) in a code comparison project.
- The EPR Working Group (ERPWG) meets regularly with representatives of AREVA, EDF, and other EPR-licensees, applicants, and potential applicants to discuss similarities and differences among the EPR designs being licensed in each country.
- The Digital Instrumentation and Controls Working Group (DICWG) interacts frequently with applicable standards organisations, IEC and IEEE, by including representatives of IEC and IEEE in MDEP meetings, attending IEC and IEEE meetings, and involving them in the development of common positions. The working group communicates specific suggestions to the standards organisations and the IAEA for consideration of

harmonisation in a timely manner when they are identified during its activities.

- The World Nuclear Association CORDEL group met with members of the MDEP Policy Group (PG) and the Codes and Standards Working Group (CSWG), and actively participated in the MDEP Conference. Both MDEP and CORDEL see some benefits in collaborating in the areas of codes and standards harmonisation and safety classification.

6. CURRENT ACTIVITIES

The MDEP carries out its work in issue-specific and design-specific working groups as well as the steering technical committee and its subcommittees.

The members of design-specific working groups share evaluations and other information about the relevant designs to ensure more safety focused design reviews.

The issue-specific working groups share information about regulatory requirements and practices in order to inform potential harmonisation efforts.

The Steering Technical Committee (STC) addresses many issues including ensuring consistent approaches, as applicable, among the working groups and addresses issues within its subcommittees.

The MDEP working group activities are documented in their programme plans.

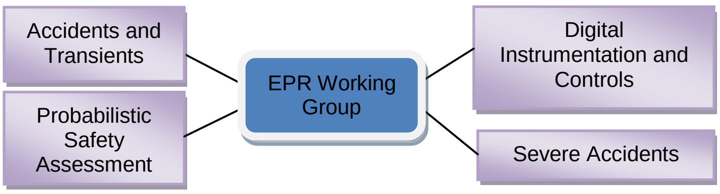
6.1 EPR Design-specific Working Group

Highlights

The MDEP EPRWG national regulators continued close co-operation on the design safety reviews of AREVA's EPR in Canada, China, Finland, France, the United Kingdom, and the United States. The group incorporated discussions with the reactor vendor and applicable licensees and operators about the EPR design and Fukushima-related issues.

The EPRWG exchanged information in the following areas: accidents and transients, digital I&C, severe accidents, probabilistic safety assessments, internal hazards, technical specifications, and the spent fuel cask loading device.

Members of the EPRWG visited the Okiluoto 3 construction site in Finland as well as the Cattenom nuclear power station in France to discuss EPR design issues with AREVA, EDF, TVO, TNPJVC, UniStar, and EDF Energy.



The EPR Working Group currently consists of the regulatory authorities of France, Finland, United States, United Kingdom, China and Canada. This working group was established in January 2006 as multilateral co-operation with France, Finland and the US. Numerous meetings and technical exchanges have taken place to share information on the reviews being conducted in each country: Olkiluoto 3 (OL3) which is under construction in Finland; Flamanville 3 which is under construction in France; and the US version of the EPR which is under review for design certification in the US and is referenced by four combined license applications. In November 2008, China and the UK were added as members. China (NNSA) issued construction permits for two EPRs at the Taishan site, and construction is well underway. UK/ONR has completed the current phase of its review and has issued an interim Generic Design Assessment of the EPR design and has made public a suite of technical assessment reports. Canada (CNSC) review of the EPR design was placed on hold at the request of AREVA.

The working group currently includes four subgroups that are addressing information on specific technical issues: Accidents and Transients, Digital Instrumentation and Controls, Probabilistic Safety Assessment, and Severe Accidents. The subgroups meet regularly to exchange information on relevant aspects of the design review status, share relevant evaluations when they become available, produce technical reports to identify and document similarities and differences among designs, regulatory safety review approaches and resulting evaluations. In addition to the four standing technical expert subgroups, the EPRWG has ad hoc subgroups to address important issues and to support design safety review decision-making, such as radiation protection, technical specifications, and internal hazards. The EPRWG provides recommendations, when appropriate, to issue-specific working groups for considering possible items such as a topic to address generically (for example, common positions on digital I&C, separation of safety and non-safety communications, and issues on hydrogen management and core melt cooling identified by the EPR Severe Accident Subgroup).

Accomplishments

The EPRWG has published a common position on the EPR Digital Instrumentation and Control reactor protection system design and has drafted common MDEP positions on (1) containment mass and energy release and (2) containment response during design basis and severe accidents (the latter two common positions are not yet publicly available). The EPRWG participants addressed aspects of the review to enhance safety and standardisation of designs, co-ordinated communications on MDEP views and common positions to vendors and operators; drafted technical reports to identify and document similarities and differences among designs, regulatory safety review approaches and resulting evaluations, and shared lessons learned from design reviews and design issues faced during construction. The EPRWG developed a communications plan that covers publishing significant documents

The EPRWG met and communicated frequently with representatives of AREVA, EDF, and other EPR-licensees, applicants, and potential applicants to have them explain similarities and differences among the EPR designs being licensed in each country. The areas of differences include the categories of (1) differing analysis; (2) differing mechanical system features; (3) differing electrical system features; (4) differing I&C system features; and (5) differing building and ventilation features. Reasons for such differences included utility and operator needs, industrial practices and regulatory requirements.

The EPRWG also met with AREVA and other EPR licensees and applicants to discuss post-Fukushima safety reviews. AREVA representatives discussed the robustness of the EPR design that is already being licensed in MDEP countries, as well as actions AREVA/EDF is taking as a result of the Fukushima accident to identify possible improvements and to strengthen defense-in-depth. It was agreed that the EPRWG and the EPR family (a forum of organisations involved in the design and licensing of the EPR in several countries) via AREVA will continue to communicate regarding this issue.

EPRWG Probabilistic Safety Assessment Subgroup

The Probabilistic Safety Assessment Subgroup is identifying the design differences and modifications affecting risk and the main differences in PSAs. The issues being addressed by the subgroup include: potential loss of two safety divisions, fire risks, I&C, level 2 PSA and severe accidents, and use of a simplified probabilistic risk assessment (PRA) model**.** The subgroup plans to produce a technical report documenting the differences among the designs being reviewed in each country that affect risk assessment, and the main differences in the PSA results and risk profiles. The approach is being carried out in a “top-down” approach in three phases. Currently the subgroup is in Phase 1 – Collection of initial set of information. As part of this phase, the subgroup conducted a web conference in October 2011. Phases 2 and 3 involve detailed comparisons of selected internal events, and drafting of the PRA comparison report. As part of Phase 2, the EPRWG members conducted a workshop in April 2012 to discuss the detailed comparison of selected initiating events. A future workshop to which AREVA and EDF are planned to be invited will be held in the September/October 2012 timeframe. At this event several topics will be discussed including (1) differences in modelling of reactor coolant pump seal loss-of-coolant accident (LOCA), calculation of loss of cooling chain (LOCC) initiating event frequencies, and update of EPR PRA modeling differences. The subgroup plans to produce a draft comparison report by late 2012/early 2013.

EPRWG Accidents and Transients Subgroup

The Accidents and Transients Subgroup is identifying differences in regulatory criteria and approaches among the member countries. The subgroup addressed the following topics:

(1) comparison of regulatory criteria and approaches to analysis, (the subgroup has produced a draft document on EPRWG approaches);

(2) comparison of evaluation methodologies for these analyses (the subgroup will choose one specific accident and investigate that issue further as a pilot project);

(3) availability of safety evaluations to share, (the subgroup developed a list of evaluations in this area to share among the subgroup members);

(4) evaluation of containment circulation and mixing (common position drafted);

(5) mass and energy releases in containment (common position drafted);

(6) comparison of the design of control rods (discussed with AREVA/EDF);

(7) containment sump design and performance (group continues to discuss sump test specifications and test results);

(8) monitoring criticality during fuel loading (regulatory approaches were discussed, may produce a common position on this issue);

(9) heterogeneous boron dilution events (regulatory approaches were discussed, may produce a document describing the approaches by the regulators);

(10) departure from nucleate boiling ratio methodologies (discuss further in order to understand the basis for the different critical heat flux correlations).

EPRWG Digital Instrumentation and Controls Subgroup

The Digital Instrumentation and Controls Subgroup focused on the following five core areas of the EPR I&C design: I&C System Independence (particularly for data communications); Information Security; Level of Detailed Design specifications; Levels of Defence in Depth and Diversity; and Verification and Validation of Software. Progress is being made by all countries on the EPR digital I&C reviews, and most countries are currently concentrating on close-out of technical questions in the digital I&C area. The main technical issues raised were consistently the independence of systems and the qualification of the SPPA T2000 platform. The WG issued a common position documenting aspects of the EPR design where the countries had common agreement. The Common Position was finalised and made public on 15 March 2011 on the MDEP public website. The subgroup plans to produce a technical report that will identify differences and similarities among the EPR designs and the major outcomes of EPRWG interactions.

EPRWG Severe Accidents Subgroup

The Severe Accident Subgroup has achieved its goal of identifying and understanding the differences among the designs, and singled out specific design differences for further internal exchanges among its members. As a result of the exchanges and further discussions by the subgroup members, the Severe Accidents Subgroup will focus on the following topics in the future:

- sacrificial concrete composition in the reactor pit;
- containment heat removal system active flooding;
- debris ingression into valve compartments near the core catcher spreading area;
- pH control in the in-containment reactor water storage tank and the drawbacks of passive pH control;
- dual use of the Primary Depressurisation System (feed and bleed and severe accidents);
- containment venting/filtration system.

In addition, the subgroup will address lessons learned from Fukushima for EPR severe accidents.

EPRWG ad hoc subgroup issues

In addition to the expert subgroups, the EPRWG also held meetings and teleconferences to discuss other issues of interest including: Radiation Protection, Technical Specifications, Internal Hazards, and Grouted Tendons in Civil Structures. The WG is developing a source term survey with the goals of (1) understanding how the source term has been defined for the various EPR designs, (2) identifying differences and explain their origin, and (3) sharing common positions on this issue. A draft questionnaire was drafted by France, which will be sent to all EPRWG members and co-ordinated with the Severe Accidents and Accidents and Transients Subgroups, and a report will be prepared based on the results in 2013. In addition, in October 2011, EDF hosted a visit at its Cattenom site so that EPRWG members could learn more about the Spent Fuel Cask Loading Device that is part of the various EPR designs and is in operation in several French and Belgian nuclear plants.

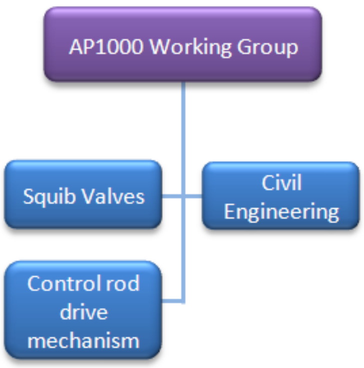
6.2 AP1000 Design-specific Working Groups

Highlights

The AP1000WG shares insights and evaluations of safety reviews of the AP1000 designs that are being considered or licensed in Canada, China, the United Kingdom, and the United States. This past year, construction has started on AP1000s in the United States which joined the two sites in China where AP1000s are being built.

Possible continued co-operation for this working group are Fukushima-related issues and operational testing as well as other issues identified in the Generic Design Assessment by the United Kingdom's HSE/ONR, the various AP1000 design certification amendment requests in the US, as applicable, and issues that may be identified by China's NNSA.

The AP1000 Design-specific Working Group was established in November 2008 with initial participation by China (NNSA), UK (ONR), and US (NRC). Canada (CNSC) was added as a member in March 2009. A total of four AP1000 units are under construction in China at the Sanmen and Haiyang sites. The NRC completed its review of the AP1000 design and issued an amendment to the design certification in December 2011. The NRC issued combined construction and operating licenses to four AP1000 units in early 2012 and construction is underway at Vogtle Units 3 and 4 and Summer Units 2 and 3. The NRC is reviewing applications for an additional eight AP1000 units. The first AP1000 in the US is expected to begin safety-related construction in early 2012. UK/ONR has completed the current phase of its review and has issued an interim Generic Design Assessment of the AP1000 design and made public a suite of technical assessment reports. CNSC completed phase 1 of its pre-project design review on the potential choices for new reactor construction, including the AP1000 in January 2010. The purpose of the Phase 1 review is to determine whether the design intent in the safety areas is compliant with the CNSC requirements and expectations for the design of new nuclear power plants in Canada. No further activities are planned by CNSC in the near future. The AP1000 DSWG chair is the US, the country of the design originator; and China, as the first country to begin the construction of an AP1000, is the vice-chair.



A co-operation initiative has been set up between NNSA and the US NRC regarding inspector exchanges. The US NRC sent two resident inspectors for three months and another inspector as a technical reviewer for one month, and one Chinese inspector trained in the NRC's Region II for six months. The US NRC and the UK ONR have been sharing the results of their reviews and resolution of significant technical issues in the lead up to completion of major parts of their design reviews in 2011.

The AP1000 Working Group addressed three specific design features of the AP1000 through expert subgroups: civil engineering (focusing on the design of the AP1000 shield building), squib valves, and control rod drive mechanisms.

Accomplishments

The working group has shared design information, application documents, and preliminary findings within the group, and identified the most significant review issues. The members have also shared information on construction experience. The WG members also shared information on how Fukushima lessons learned were being addressed in each country, and the potential impact on their review of the AP1000 design.

AP1000WG Civil Engineering Subgroup

The civil engineering subgroup was formed primarily to address the unique design of the shield building, and outstanding questions regarding the modular construction techniques to be used. The subgroup members compared results of their separate reviews of the shield building design and came to similar conclusions regarding fundamental concerns. The discussions were helpful in confirming conclusions already identified by the regulators. In the absence of applicable design standards for concrete composite structures, the expert subgroup developed a preliminary set of technical considerations to be used for novel civil engineering construction (such as modular steel composite structures). These considerations may be used to provide input to the standards organisations in developing a code case for modular construction.

AP1000WG Squib Valve Subgroup

The AP1000WG Squib Valve Subgroup was formed to address the unique design of the in-containment refueling water storage tank injection fourth-stage depression valves (squib valves). The squib valves to be used on the AP1000 are much larger than those used in existing nuclear applications. The members agreed that the lack of experience with large squib valves required particular care in the design, qualification, and in-service inspection/testing of these valves. The Squib Valve Subgroup issued a common position on technical guidelines for the design, qualification, and in-service inspection/testing of explosive-actuated valves. The guidelines are intended to be helpful to regulators and the nuclear industry in understanding the technical issues associated with large, explosive-actuated valves used in AP1000 reactors and other reactor designs.

AP1000WG Control Rod Drive System Subgroup

The Control Rod Drive System Subgroup was formed to address the safety classification, particularly the classification of the latch mechanisms and the adequacy of any associated testing or analysis to show that the latch mechanisms can perform their intended safety function. The subgroup members compared information on the design and the reasons for their conclusions on safety classification.

AP1000WG ad hoc subgroup issues

In addition to the expert subgroup interactions, WG members shared information on the digital I&C system and spent fuel pool design.

6.3 Vendor Inspection Co-operation Issue-specific Working Group

Highlights

To move toward its goal of carrying out multinational inspections of vendors of reactor components, the MDEP VICWG co-ordinated six witnessed inspections and one joint inspection, in 2011. The experience gained through these common inspections has begun to be processed to extract the best practices and find out the impediment to be overcome. Moreover, the VICWG is working to identify a common set of quality assurance criteria to be used as requirements for multinational QA inspections.

The VICWG finalised its survey on quality assurance programme requirements which details how each country performs its inspections of vendor activities. To go one step further in the understanding of different countries inspection practices, the VICWG also decided to update and complement its 2008 survey on vendor inspection practices.

The VICWG shares through the MDEP Library their up-to-date inspection programmes for inspections to be opened to witnessing or participation.

Background

The Vendor Inspection Co-operation Working Group (VICWG) was formed because component manufacturing is currently subject to multiple inspections and audits similar in scope and in safety objectives, but conducted by different regulators to different criteria. The primary goal of the VICWG is to maximise the use of the results obtained from other regulator's efforts in inspecting vendors.

Long-term goals of the working group include harmonisation of quality assurance/management (QA/QM) requirements and standards; harmonisation of vendor inspection practices among MDEP regulators; and performing multinational inspections of vendors according to the common QA/QM requirements. To achieve these goals, the VICWG is working to identify and document a set of common QA requirements, agree on an acceptable method to assess the implementation of the requirements, and develop an MDEP QA/QM inspection procedure.

The VICWG enhances the understanding of each regulator's inspection procedures and practices by co-ordinating witnessed inspections of safety related mechanical pressure retaining components (Class 1) such as pressure vessels, steam generators, piping, valves, pumps, etc., and quality assurance (QA) inspections. In addition, they share inspection results through a database. Longer term, a process will be developed to adapt the scope of an inspection according to the need of other regulators.

Accomplishments

The VICWG has achieved its short-term goals and continues to make progress towards achieving its long-term programme goals. For the intermediate term, emphasis will be placed on maximising information sharing, joint inspections (multiple nations inspecting to the regulatory requirements of one country), and witnessing of other regulators' inspections. The VICWG will also work with standards developing organisations (SDOs) to encourage and explore harmonisation of QA/QM standards.

A total of six witnessed inspections and one joint inspection were conducted pursuant to the VICWG Programme Plan in 2011. Witnessed inspections consist of one regulator performing an inspection to its criteria, observed by representatives of other MDEP countries. The benefits to the observing countries include additional information and added confidence in the inspection results. MDEP regulators are using the experience gained during conduct of VICWG witnessed inspections in their inspection planning.

Joint inspections consist of one regulator conducting an inspection according to its own regulatory framework with the active participation of one or more other regulators. This would allow the participating members to use the results of the inspection that are applicable to their regulations. One joint inspection of Doosan was held with participation by KINS and NRC. It was found to be a worthwhile experience and productive to all involved. Overall the joint inspection was deemed a success at saving resources and continuing exchange of information among VICWG members.

The VICWG maintains a vendor inspection planning table with a list of scheduled vendor inspections to assist the member regulators in identifying opportunities to observe an inspection or obtain the results of an inspection carried out by another member.

In order to improve the process for sharing inspection results, the WG developed a procedure to share inspection results, and improved the MDEP Library to include an inspection results database. This database includes not only the reports of witnessed and joint inspections, but all inspections that may be of interest to MDEP members. Based on lessons learned from conducting witnessed and joint inspections, the WG continues to update the procedure for sharing inspection results, and improves the library to make the inspection results database more user-friendly.

The working group conducted a survey on quality assurance requirements used in the oversight of vendors to identify those areas where the various regulators have common regulatory frameworks. A comparison table was analysed, and a QA/QM Criteria Comparison Report written. The survey results are available on the MDEP website as MDEP VICWG-02 Technical Report. Using this comparison, the WG will pursue identifying MDEP Core QA requirements by augmenting the comparison with those requirements used by MDEP regulators from 10 CFR Part 50 Appendix B, IAEA GS-R-3, and ISO 9001+. This activity supports the identification of common QA requirements that could be acceptable to MDEP regulators and that could eventually support multinational inspections.

Future Actions

The participating regulators have gained much experience in each other's inspection processes through MDEP witnessed and joint inspections conducted since 2008. Therefore, the working group will continue to co-ordinate witnessed inspections and will increase its focus on joint inspections in 2012. This will continue to enhance the exchange of information between the regulators and provide better understanding of the inspection scopes and safety findings and how these findings may be utilised. The WG goal is to hold at least two joint inspections in 2012. In addition, the working group will consider conducting a joint inspection with more than two regulators to help inform the process of preparing for multinational inspections. The issue of conducting multinational inspections (defined as an inspection that is carried out by inspectors from multiple regulators on a vendor against a common set of requirements) is under discussion by the WG. Conducting joint inspections and formulating common QA/QM criteria are informing the issue of conducting multinational inspections.

The WG plans to identify common quality assurance requirements from 10 CFR 50 Appendix B, IAEA GS-R-3, and ISO 9001+ that could be acceptable to MDEP regulators. The long-term goal of the WG is to harmonise a significant portion of the quality assurance inspection procedures so that the results of an inspection conducted by one member could be used by the other members, requiring that other member countries only inspect that portion of their requirements not covered by the common inspection procedure. The working group will interact with the standards development organisations (ASME, JSME, AFCEN, KEA, CSA, NIKIET) to start discussing ideas about potential harmonisation of standards. Longer term, the working group is considering developing a common MDEP vendor inspection procedure that could be used for multinational vendor inspections.

6.4 Codes and Standards Working Group

Highlights

The goals of the MDEP CSWG include promoting harmonisation of mechanical codes and standards, where possible, for important reactor pressure boundary components. With those goals in mind, the CSWG has worked closely with the various standards development organisations (SDOs) in Canada, France, Japan, Korea, Russia, and the United States, as well as industry representatives interested in piloting harmonisation through the World Nuclear Association's (WNA) Working Group on Co-operation in Reactor Design Evaluation and Licensing (CORDEL).

The SDOs achieved a major milestone by completing the initial version of the Code Comparison report which can be used by the CSWG, SDOs, and the industry as a basis to move forward with harmonisation efforts.

The CSWG will work with the SDOs in the formulation and execution of their planned Code Convergence Board and with WNA/CORDEL to explore harmonisation efforts. The CSWG will continue to finalise its common positions on the plan for code harmonisation, and the fundamental attributes and essential performance guidelines for pressure boundary components.

Background

The ultimate goal of the Codes and Standards Working Group (CSWG) is harmonisation of code requirements for design and construction of pressure-retaining (pressure boundary) components in order to improve the effectiveness and efficiency of the regulatory design reviews, increase quality of safety assessments, and to make each regulator stronger in its ability to make safety decisions.

The CSWG recognised early on that the first step to achieving harmonisation is to understand the extent of similarities and differences amongst the pressure-boundary codes and standards used in various countries. The CSWG encouraged standards development organisations (SDOs) to conduct code comparisons, study the similarities and differences between codes, and develop a strategy and process for achieving code harmonisation. The SDOs formed a steering committee composed of the representatives of ASME, JSME, KEPIC, AFCEN, CSA, vendors, and utilities which performed a comparison of their pressure-boundary codes and standards to identify the extent of similarities and differences in code requirements and the reasons for their differences (this group was eventually augmented by representatives from Russia's NIKIET). The CSWG was represented on the steering committee by the representative from the US NRC. The SDOs compared requirements of their pressure-boundary codes and standards including JSME's S-NC1 Code (Japan), AFCEN's RCC-M Code (France), KEA's KEPIC Code (Korea), CSA's N285.0 standard (Canada) and NIKIET's PNAE G-7 Code (Russia) against the requirements of Section III of the ASME Boiler and Pressure Vessel Code (United States) for Class 1 vessels, piping, pumps and valves and issued a report. The results enabled the CSWG to understand from a global perspective how each country's pressure-boundary code or standard evolved into its current form and content.

The CSWG will work closely with SDOs and WNA/CORDEL to converge code requirements and reconcile code differences. The CSWG is also working with the SDOs to develop a strategy to prevent, minimise or limit future code divergences (the SDOs have proposed formation of an SDO Code Convergence Board to limit future code differences and explore opportunities for harmonisation of existing code requirements).

Other objectives of the WG include exploring ways to evaluate acceptability of components that are designed and manufactured using foreign codes and standards, and evaluating the differences in codes applications on the quality and safety of nuclear power plants.

Accomplishments

The code comparison report and tables were finalised and were made publicly available on the ASME website (in the form of an ASME Standard Technical Publication) and the NEA's MDEP public website. Although the comparison of the Russian Code (NIKIET's PNAE G-7 Code) against the ASME Code has been completed, there was not sufficient time to include this comparison into the current report. The Russian Code comparison will be included in Revision 1 to the report in 2012, along with some changes to the JSME comparison. The SDOs' Code Comparison report does not make any conclusions about the comparisons. The CSWG will evaluate the report and make conclusions on the code-comparison and harmonisation of pressure-boundary codes and standards.

The results provided a significant amount of information about the comprehensiveness and technical adequacy of each country's pressure-boundary codes and standards and produced a wealth of useful information about the technical and programmatic similarities and differences between each country's codes including the reasons for these differences. Consequently, the results will enable regulators as well as other users of the code comparison report to determine the impact of those differences and their safety significance as well as provide insights into the level of effort needed to reconcile those differences.

The WG developed several work products separate from the SDOs' code comparison activity. These documents will eventually take form as CSWG common positions. An overall plan for harmonisation document is being discussed by the CSWG. A Fundamental Attributes of Mechanical Codes document was drafted that establishes high-level requirements or fundamental concepts for codes and standards. The WG also drafted a Essential Performance Guidelines document, and a Description of MDEP Regulator's Practices in Using Mechanical Codes and Standards. The WG plans to seek input on this documents from internal and external stakeholders in the middle of 2012 and then to finalise and issue these common positions.

Next steps

The results of the code comparison project enabled the CSWG to take the next steps towards harmonisation of codes and standards. The CSWG will keep engaged with the SDOs' efforts in forming an SDO Code Convergence Board and its commitment to limit future significant code divergence and exploring opportunities to harmonise existing requirements. In addition, the CSWG has been interacting with the World Nuclear Association's Working Group on the Co-operation in Reactor Design Evaluation and Licensing (WNA/CORDEL) regarding its plans for achieving international standardisation of reactor designs, the CORDEL Group identified an urgent need for the international harmonisation of standards and codes. CORDEL is supportive of the CSWG's long-term goals and the SDOs' code comparison effort and proposed to take harmonisation to the next level by trying to converge on selected code differences that have the most impact and are relatively easy to achieve. CORDEL has proposed a pilot project regarding exploration of potential harmonisation among the various codes. Based on the results of the SDOs' code comparison, CORDEL and the SDOs are planning to select a few specific code rules where differences have the most important industrial impact and convergence is relatively easy to achieve. CORDEL plans to choose independent technical experts to propose a "harmonised" version of the code differences or to demonstrate equivalence of these differences. The proposed pilot project will be co-ordinated and funded by CORDEL, and will be conducted in co-ordination with the CSWG. WNA/CORDEL is in the process of creating a survey to send to its members, SDOs, and MDEP to inform the choice of topics for potential code harmonisation.

The WG will explore ways to evaluate the acceptability of components that are designed and manufactured using foreign codes and standards, and to evaluate the differences in codes applications on the quality and safety of nuclear power plants.

Plans to further expand the scope of work to include Class 2 and 3 vessels, piping, pumps and valves will depend on the success of the project for Class 1 components. Ultimately, MDEP will consider expanding the codes and standards harmonisation effort to areas beyond pressure boundary components.

6.5 Digital Instrumentation and Controls Working Group

Highlights

A goal of the MDEP Digitial Instrumentation and Control Working Group (DICWG) is to explore harmonisation of national and international codes and standards in the area of digital instrumentation and control of reactor safety systems. In 2011, the DICWG documented two additional common positions addressing the areas of the impact of cyber security features on safety systems in nuclear power plants and on digital instrumentation and control safety systems in the areas of verification and validation of digital control systems.

The DICWG interacts routinely with the IAEA, IEC, and IEEE in encouraging harmonisation of digital instrumentation and control requirements.

Background

The primary goals of the Digital Instrumentation and Controls Working Group are to develop generic common positions for the digital instrumentation and control issues of significance, and to make substantial progress toward harmonisation of digital instrumentation and control standards. The DICWG works to increase collaboration, co-operation, and knowledge transfer among members and with other stakeholders to achieve the goals above.

The DICWG is enhancing its co-operation with the standards organisations, Institute of Electrical and Electronics Engineers (IEEE) and International Electrotechnical Commission (IEC). Both organisations expressed a significant interest in DICWG and expressed their commitment to co-operate with the working group. Representatives from IEC, and the IAEA participate in most of the working group meetings, and IEC allowed a number of their standards relevant to digital I&C to be made available in the MDEP Library for use by the working group members. The IEC formalised an agreement with the OECD to facilitate co-operation between the two organisations. In addition, the DICWG members jointly research and comment on proposed IEC, IEEE, and the IAEA standards that are relevant to the regulatory review of digital I&C systems. They make suggestions to, and share observations and insights learned with, standards development organisations regarding harmonisation and convergence of standards.

The DICWG facilitates timely and efficient sharing of knowledge and experience among members, thus allowing knowledge transfer and more effective safety reviews. The WG also engages a broad spectrum of utilities and equipment vendors to exchange relevant information and lessons learned relevant to the working group's efforts.

Accomplishments

The working group has identified 12 topics for which it will pursue the development of common positions. The priority for developing each common position is assessed through (1) the level of effort for development of the common position, based on the scope of the guidance and the perceived or actual consensus of the position, and (2) the technical significance of the common position, based on the significance of the regulatory need for the common position.

To date, the working group has finalised five common positions on Software Tools, Communication Independence, Simplicity in Design, the Verification and Validation of Digital Safety Systems, and the Impact of Cyber Security Features on Digital Safety Systems and those common positions have been made publicly available on the MDEP website. These positions have been provided to the MDEP Steering Technical Committee for approval. Seven additional common positions are under development. The common positions under development include:

- Software Common Cause Failures in Safety Systems
- Complex Electronics
- Qualification of Industrial Digital Devices of Limited Functionality for Use in Safety Applications
- System Architecture Considerations for Systems Classified at the Highest Safety Level
- Configuration Management for Software
- Factory and Site Acceptance Testing
- Surveillance and Periodic Testing

The DICWG reviewed the new IAEA Safety Guide for I&C Systems in Nuclear Power Plants (DS-431) and identified recommendations for how the draft guide should be modified to be consistent with the five MDEP common positions that have been or are close to issuance. In December 2011, the Chair of the DICWG participated in an IAEA technical meeting to review the Draft I&C Safety Guide, representing MDEP's position. The IAEA embraced MDEP's recommendations, and incorporated nearly all of MDEP's comments.

The working group continued to achieve the objective of sharing of valuable information. The working group continues to implement a formal "Quick Inquiry" process to generate and process inquiries from member countries to promote an efficient and structured information exchange and provide for storing this information in a retrievable database. The DICWG maintains frequent communication with the design-specific working groups, particularly with the EPR Digital Instrumentation and Controls Subgroup.

Next steps

The working group will work to finalise common positions for the remaining issues. The working group has prioritised the issues and has identified schedules for development, review, and issuance of each common position.

The working group will communicate specific suggestions to the standards organisations and the IAEA for consideration of harmonisation in a timely manner when they are identified during its activities. For example, MDEP may be able to help co-ordinate the development of cyber security standards by serving as the focal point for harmonising the IAEA, ISO, IEC, and IEEE cyber security standards development.

The working group will continue to engage digital I&C vendors and utilities to share experience and insights toward developing common positions that are based on a broad spectrum of inputs.

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6.6 Safety classification

Highlights

In 2011 the STC decided to co-ordinate MDEP views and input to the IAEA revision of draft safety guide 367, "Safety Classification of Structures, Systems, and Components of Nuclear Power Plants." Members of this Subcommittee have attended several IAEA consultancy meetings on this subject and plan to continue to interact with the IAEA and other stakeholders in this process to provide MDEP input.

Background

Several of the MDEP working groups raised concerns regarding challenges encountered by the use of different safety classification schemes by MDEP members. A subcommittee of the STC was formed to explore the issues association with safety classification which focused its efforts on providing input to a draft IAEA standard DS367, "Safety Classification of Structures, Systems and Components in Nuclear Power Plants".

On 14-18 November 2011, representatives of three MDEP members, US, Canada, and Finland, participated in a consultancy meeting at the IAEA on the DG-367, "Safety Classification of Systems, Structures, and Components." The participants presented their organisation's comments and positions, as well as shared and discussed the perspectives from MDEP on the subject. Additional consultancy meetings will be necessary to address the comments and finalise DS-367. The participants will keep MDEP informed of the DS-367 development status and path forward.

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7. INTERIM RESULTS

MDEP is considered a long-term programme that focuses on interim results. Interim results are significant events that communicate MDEP activities and those products such as common positions that document agreement by MDEP member countries and are necessary steps in working towards increased co-operation and convergence. The interim results for 2011 include:

- Conducted the Second MDEP Conference on New Reactor Design Activities to further communicate MDEP activities to important stakeholders including non-MDEP regulators and industry
- Drafted common positions on the evaluation of containment circulation and mixing, and mass and energy releases in containment for the EPR.
- Co-operated on six witnessed vendor inspections and one joint inspection.
- Updated and finalised a QA/QM Criteria Comparison Report survey on quality assurance requirements used in the oversight of vendors.
- Interacted with the standards development organisations to complete and issue comparison tables of the ASME Boiler and Pressure Vessel Code, AFCEN's RCCM Code, JSME S NC1, NIKIET's PNAE G-7 Code, CSA's N285.0 Code,and KEPIC code for Class 1 pressure vessels, piping, pumps, and valves.
- Identified a complete list of 12 technical issues in the area of digital I&C that will be pursued by MDEP for the development of common positions.
- Finalised common positions, on verification and validation throughout the life cycle of safety systems using digital computers, and on the impact of cyber security features on digital safety systems.
- Drafted common positions on "Harmonisation of Mechanical Codes for Pressure Boundary Components," "Fundamental Attributes of Mechanical Codes" that establishes high-level requirements or fundamental concepts for codes and standards, and "Essential Performance Guidelines" and a technical report on "Description of MDEP Regulator's Practices in Using Mechanical Codes and Standards."
- Provided consolidated MDEP recommended modifications to the IAEA for a draft Safety Guide on I&C Systems in Nuclear Power Plants (DS-431) consistent with MDEP common positions, which were well accepted and incorporated.
- Co-ordinated MDEP views and communications about the revision of DS-367, "Safety Classification of Structures, Systems, and Components of Nuclear Power Plants.
- Although the STC Subcommittee's work on safety goals was completed in 2010 with the documentation of its safety goals position paper, members of the subcommittee were key players in the IAEA's workshop on safety goals in April 2011.

8. NEXT STEPS – FUTURE OF THE PROGRAMME

The results of the self-assessment, discussed in section 3.0, will be used as an input to determining (1) when current activities and working groups should be considered complete, (2) the process of closing out activities, or transferring them to other organisations, (3) the role of design-specific working groups after completion of the planned design reviews and (4) possible new topics to be addressed by the programme.

MDEP will use the following criteria to evaluate whether a proposed activity should be undertaken as part of MDEP (in the form of a working group for a new generic topic or a subcommittee of the STC):

(1) the activity is of generic interest and of safety significance to the licensing of new reactors in MDEP member countries;

(2) the approach followed by MDEP regulators is not completely similar;

(3) the successful completion of the activity would likely result in increased harmonisation/convergence in regulatory practices or increased co-operation within a reasonable timeframe and resource expenditures;

(4) any new MDEP activity should not duplicate similar efforts that are already ongoing or are planned to be undertaken by other more appropriate organisations such as the CNRA/WGRNR (or other NEA WGs), the IAEA, GIF, WENRA, etc. except

where MDEP could contribute to the ongoing work of these groups;

(5) any new activity should have a lead country willing to take an active leadership role, and should have a defined product.

MDEP can play a significant, positive role by co-operating with current efforts in other organisations, and will search out areas where it can act as a catalyst for enhanced regulatory co-operation and convergence in other forums. MDEP is in a unique position to effect positive change because it includes the regulatory authorities of over three quarters of the reactors world-wide and represents those agencies at the highest levels. MDEP is using its influence to initiate change and will contribute to the success of other initiatives including those of the IAEA and NEA.

Appendix A

Summary of MDEP products: March 2011-March 2012

Summary of MDEP products: March 2011-March 2012

The MDEP Steering Technical Committee approved the following documents which were issued during the period March 2011 – March 2012. They are available on the MDEP website, http://www.oecd-nea.org/mdep/.

Generic Common Position DICWG No 3: Common Position on Verification and Validation throughout the Life Cycle of Digital Safety Systems

The Digital I&C Working Group developed this common position to provide guidance on how validation and verification should be implemented for nuclear power plant safety systems. The position applies to V&V activities for digital safety systems throughout their life cycles and encompasses both software and hardware for such systems. The position provides guidance on confirming compliance with the system functional performance and interface requirements; the qualification of individuals performing V&V, documentation of information; use of pre-developed software, and change control.

Generic Common Position on Verification and Validation:

1) V&V should confirm that the products of each development phase fulfil the requirements or conditions imposed by the previous phase, and confirm compliance with the system functional performance and interface requirements.

2) In the digital safety system's life cycle, all relevant processes should be defined. V&V should be conducted in accordance with the V&V plan.

3) V&V should be performed by technically qualified individuals in an appropriately independent group who has not been engaged in design & development of the system.

4) All information and processes required for V&V should be properly documented.

5) Pre-developed software should be in accordance with the V&V plan

6) Change control should be implemented throughout the life cycle

Generic Common Position DICWG No 8: Common Position on the Impact of Cyber Security Features on Digital I&C Safety Systems

This common position documents the member countries' agreement that implementation of cyber security features should not adversely impact the performance (including response time), effectiveness, reliability or operation of safety functions. It is recognised that a cyber security program may be implemented at nuclear facilities to protect against cyber attacks, and the implementation of such a cyber security program may vary based on site specific requirements and each country's regulatory frameworks. This common position is intended to only apply to systems classified to the highest level of safety. Generic Common Position on the Impact of Cyber Security Features:

1) Implementation of cyber security features should not adversely impact the performance (including response time), effectiveness, reliability or operation of safety functions.

2) Implementation of cyber security features directly in the safety system should be avoided when practical.

3) If cyber security features are implemented in safety system displays and controls, they should not adversely impact the operator's ability to maintain the safety of the plant.

4) If cyber security features need to be implemented on digital I&C safety systems, adequate measures should be taken to ensure that these features do not adversely affect the ability of a system to perform its safety functions

5) Cyber security features included in safety systems should be developed and qualified to the same level of qualification as the system these features reside in.

VICWG-02 Technical Report - Survey on Quality Assurance Program Requirements

This survey was prepared by the Vendor Inspection Co-operation Working Group to compare the quality assurance program requirements of the MDEP regulatory bodies. The survey was prepared using the format of the U.S. requirements of Appendix B to 10 CFR Part 50, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants." These requirements form the basis upon which the U.S. NRC oversees the activities of vendors providing parts and services to the commercial U.S. nuclear power industry. The survey of each MDEP member's requirements is divided into the 18 basic criteria of Appendix B to 10 CFR Part 50. Within each criteria there are individual requirements that have been identified as separate and distinct elements that are covered during the inspection of vendor activities.

Appendix B

Table of acronyms

Table of acronyms

AP1000WG	*Advanced Pressurised Reactor Working Group (MDEP)*
AFCEN	*French Society for Design and Construction and in-Service Inspection Rules / Association Française pour les règles de Conception, de construction et de surveillance en exploitation des matériels des Chaudières Electro Nucléaires*
ASME	*American Society of Mechanical Engineers*
CNRA	*Committee on Nuclear Regulation (NEA)*
CNSC	*Canadian Nuclear Safety Commission*
CORDEL	*Co-operation in Reactor Design Evaluation and Licensing*
CSA	*Canadian Standards Association*
CSWG	*Codes and Standards Working Group (MDEP)*
DI&C	*Digital Instrumentation and Control*
DICWG	*Digital Instrumentation and Control Working Group (MDEP)*
EDF	*Electricité de France*
EPR	*Evolutionary Pressurised Reactor*
EPRWG	*Evolutionary Pressurised Reactor Working Group (MDEP)*
GIF	*Generation IV international Forum*
GS-R-3	*IAEA Safety Standards/the Management System for Facilities and Activities/Safety Requirements*
IAEA	*International Atomic Energy Agency*
I&C	*Instrumentation and Controls*
IEC	*International Electro-technical Commisstion*
IEEE	*Institute of Electrical and Electronics Engineers*
INSAG	*International Nuclear Safety Group*
ISO	*International Standards Organisation*
JSME	*Japan Society of Mechanical Engineering*
KEA	*Korean Electronic Association*
KEPIC	*Korea Electric Power Industry*
MDEP	*Multinational Design Evaluation Programme*
MHI	*Mitsubishi Heavy Industries*
NEA	*Nuclear Energy Agency*

NIKIET	*Russian Research and Development Institute of Power Engineering*
NNSA	*National Nuclear Safety Administration (China)*
NPEC	*Nulcear Power Engineering Committee*
NRC	*Nuclear Regulatory Commission (United States)*
OECD	*Organisation for Economic Co-operation and Development*
OL3	*Olkiluoto-3*
ONR	*Office for Nuclear Regulation* (UK)
PNAE G-7	*Russian Rules for Deisgn and Safety Operation of Equipment and Piping of Nuclear Installations*
PG	*Policy Group (MDEP)*
PSA	*Probabilistic Safety Assessment*
QA	*Quality Assurance*
RCC-M	*Design and construction rules for mechanical components of PWR nuclear islands (Règles de conception et de construction des matériels mécaniques des îlots nucléaires des REP)*
RHWG	*Reactor Harmonisation Working Group*
RSWG	*Risk Safety Working Group*
SDO	*Standards Development Organisations*
S-NCI	*Japanese Standards for Nuclear Power Generation Equipment: Design and Construction Standards*
STC	*Steering Technical Committee (MDEP)*
STUK	*Radiation and Nuclear Safety Authority (Finland)*
TOR	*Terms of Reference*
VICWG	*Vendor Inspection Co-operation Working Group*
WENRA	*Western European Nuclear Regulators Association*
WNA	*World Nuclear Association*
WGRNR	*Working Group on the Regulation of New Reactors (NEA)*

ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT

The OECD is a unique forum where the governments of 34 democracies work together to address the economic, social and environmental challenges of globalisation. The OECD is also at the forefront of efforts to understand and to help governments respond to new developments and concerns, such as corporate governance, the information economy and the challenges of an ageing population. The Organisation provides a setting where governments can compare policy experiences, seek answers to common problems, identify good practice and work to co-ordinate domestic and international policies.

The OECD member countries are: Australia, Austria, Belgium, Canada, Chile, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Israel, Italy, Japan, Luxembourg, Mexico, the Netherlands, New Zealand, Norway, Poland, Portugal, the Republic of Korea, the Slovak Republic, Slovenia, Spain, Sweden, Switzerland, Turkey, the United Kingdom and the United States. The European Commission takes part in the work of the OECD.

OECD Publishing disseminates widely the results of the Organisation's statistics gathering and research on economic, social and environmental issues, as well as the conventions, guidelines and standards agreed by its members.

NUCLEAR ENERGY AGENCY

The OECD Nuclear Energy Agency (NEA) was established on 1 February 1958. Current NEA membership consists of 30 OECD member countries: Australia, Austria, Belgium, Canada, the Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Japan, Luxembourg, Mexico, the Netherlands, Norway, Poland, Portugal, the Republic of Korea, the Slovak Republic, Spain, Sweden, Switzerland, Turkey, the United Kingdom and the United States. The European Commission also takes part in the work of the Agency.

The mission of the NEA is:

– to assist its member countries in maintaining and further developing, through international co-operation, the scientific, technological and legal bases required for a safe, environmentally friendly and economical use of nuclear energy for peaceful purposes, as well as
– to provide authoritative assessments and to forge common understandings on key issues, as input to government decisions on nuclear energy policy and to broader OECD policy analyses in areas such as energy and sustainable development.

Specific areas of competence of the NEA include the safety and regulation of nuclear activities, radioactive waste management, radiological protection, nuclear science, economic and technical analyses of the nuclear fuel cycle, nuclear law and liability, and public information.

The NEA Data Bank provides nuclear data and computer program services for participating countries. In these and related tasks, the NEA works in close collaboration with the International Atomic Energy Agency in Vienna, with which it has a Co-operation Agreement, as well as with other international organisations in the nuclear field.

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OECD Nuclear Energy Agency
Le Seine Saint-Germain – 12 Boulevard des Iles
F-92130 Issy-les-Moulineaux, France
www.oecd-nea.org/mdep