Multinational Design Evaluation Programme (MDEP)

2nd MDEP Conference on New Reactor Design Activities

Paris, France
15-16 September 2011

Conference Proceedings

NUCLEAR ENERGY AGENCY
Organisation for Economic Co-Operation and Development

ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT

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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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Foreword

The Multinational Design Evaluation Programme (MDEP) is a unique eleven-nation initiative being undertaken by national regulatory authorities from Canada, China, Finland, France, India, Japan, Republic of Korea, the Russian Federation, South Africa, the United Kingdom, and the United States with the purposes of co-operating on safety design reviews of new reactors and indentifying opportunities to harmonise and converge on safety licensing review practices and requirements. The OECD NEA has been chosen to provide the technical secretariat support. The International Atomic Energy Agency participates in many of the MDEP activities.

Started in 2007 with co-operation on various pilot project issues, the MDEP's expected outcomes are: (1) improved effectiveness and efficiency of regulatory safety design reviews, (2) increased quality of safety assessments, and (3) identified areas for the convergence of regulatory requirements and practices. Making each regulator stronger in its ability to make sovereign safety decisions is a key objective that cuts across all MDEP activities.

In 2008, the top regulators from each national authority met as the MDEP Policy Group and adopted the present structure and programme of work for the MDEP, including the pursuit of co-operation on specific safety design reviews and pursuing closer co-ordination on harmonisation and convergence issues such as digital instrumentation and control, mechanical codes and standards, and vendor inspections. The MDEP is currently a long-term programme that focuses in near term and interim results to share within MDEP and with other stakeholders.

With effective communications in mind, the MDEP Policy Group directed the NEA to co-ordinate the second conference on New Reactor Design Activities with the purpose of communicating to a wide spectrum of stakeholders worldwide as to the program of work and accomplishments of the MDEP, and soliciting feedback and input from these stakeholders regarding recommendations on how to co-operate more efficiently on new reactor design reviews and to encourage standardisation and harmonisation on regulatory requirements and practices. Another key aspect of this conference was to allow the various industry stakeholders to share their activities on new reactor designs and standardisation efforts. These stakeholders included non-MDEP regulators, vendors, licensees, reactor applicants, industry organisations, standards development organisations, etc. The conference was held on 15-16 September 2011 at OECD Headquarters in Paris. These conference proceedings contain the details of the various sessions and the topics discussed as well as specific presentations given by panel members

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SESSION 1

WELCOME AND OPENING OF CONFERENCE

SESSION 1 SUMMARY

Luis Echávarri, Director-General of the Organisation for Economic Co-operation and Development's (OECD) Nuclear Energy Agency (NEA), opened the second Multinational Design Evaluation Programme (MDEP) Conference on New Reactor Design Activities by welcoming all attendees to the OECD Headquarters in Paris. Over 120 guests representing 23 countries and 11 international organisations attended the Conference. After having expressed his solidarity with the Japanese people, Mr. Echávarri emphasised the stress the Fukushima accident has put on organisations which are related to decision making in the nuclear field all over the world. In that context, Mr. Echávarri expressed that he believed MDEP, as one of the international initiatives that have proved to efficiently enhance overall safety, will play a role addressing post-Fukushima issues, notably thanks to the co-operation it achieves between regulators and at some level with external stakeholders.

André-Claude Lacoste, President of ASN and Chair of MDEP's Policy Group, also welcomed the attendees and provided information about MDEP's current status. Mr. Lacoste underlined the goals of MDEP, detailed the accomplishments to date for each of the working groups and highlighted the effort of communication with stakeholders, which is fundamental for MDEP to maintain and improve. In addition, Mr. Lacoste pointed out the evolution of MDEP's terms of reference which was carried out to facilitate the integration of further members including full members, associate members, and candidates.

This session concluded with brief remarks by MDEP Policy Group members from Canada, China, Finland, France, Japan, the Russian Federation, South Africa, the UK and the US. Regarding the issue related to the Fukushima accident, the PG members agreed that the MDEP will review the relevant issues and decide how to incorporate them into MDEP activities, as appropriate. Most likely this will be accomplished through the design-specific working groups and the Steering Technical Committee (STC) discussions.

During comments made at the Policy Group roundtable, the STC Chair, Gary Holahan, mentioned the intent of the STC to undertake a comprehensive self assessment of the MDEP that will include internal and external stakeholder input. The expected output of this effort is a report to the PG regarding any necessary changes to the MDEP in order to ensure the goals, objectives, and expected outcomes as documented in the MDEP Terms of Reference are being met.

Welcome and introductory remarks

Luis Echávarri
Director-General, OECD Nuclear Energy Agency

Good morning Mr. Chairman, Ladies and Gentlemen and welcome to the Second Multinational Design Evaluation Programme (MDEP) Conference on New Reactor Design Activities.

With the Fukushima Dai-ichi accident, the Conference comes in a challenging time for all of us, national regulators, reactor vendors, licensees, and others in the nuclear field. My primary thoughts go to our Japanese colleagues to whom I wish to express our solidarity in their recovery from the devastating earthquake and Tsunami that occurred on the 11th of March and the subsequent nuclear accident.

We will devote some of our time during the next two days on the accident which has impacted the work of all of our organisations. This includes obviously the OECD Nuclear Energy Agency; all the programmes of work of its Committees are being amended to draw the lessons from it. The next NEA Steering Committee policy debate on 27 October will be focused on the accident as it is the highest topic on the agenda of the international nuclear community and will probably remain so in the coming years.

The Fukushima Dai-ichi accident has once again illustrated the global character of the nuclear sector. The need for a global nuclear safety has clearly emerged from this event, with implications in terms of harmonisation of approaches and practices; it has become a broad demand from the Public and the Governments, as expressed at the G8-NEA Ministerial Seminar and Forum of Regulators that we organised with the French Government on 7 and 8 June.

This also came out clearly from the IAEA Ministerial Conference on Fukushima on 24 June and we expect an action plan to be presented very soon on the occasion of the IAEA General Conference held next week in Vienna.

The question is as always: how to proceed, given the technicality of nuclear rules and regulations, the various technologies, the responsibility of national authorities? How to go beyond basic standards, which are necessary but, as their names indicate, remain basic? I trust the MDEP is a case in point in terms of methodology and it is also why it increasingly attracts new country regulatory bodies, willing to participate.

For the last four years, the MDEP has gathered the main regulators concerned with licensing new reactors, from Canada, China, Finland, France, Japan, the Republic of Korea, the Russian Federation, South Africa, the United Kingdom, and the United States. They have continued to work diligently on this multinational initiative, on concrete reactors construction projects with the experts in their field.

The MDEP has contributed to improve the existing significant and lasting relationships between national regulators. Since the last MDEP Conference two years ago, much progress has been made by the design-specific and issue-specific working groups of the MDEP. This Conference is an opportunity to communicate about this, the products associated with co-operation on new reactor safety reviews and exploring the potential next steps in the harmonisation of regulatory requirements and practices.

The work to date already includes input from industry standards development organisations such as IEC, AFCEN, ASME, JSME and KEPIC, reactor vendors including Westinghouse and Areva, licensees worldwide, IAEA and WENRA, and other industry groups such as WNA and WANO. Industry representatives will share with us the efforts that they are undertaking to encourage standardisation.

Finally, let me stress that the NEA, acting as technical secretariat of the MDEP, give a high priority to its work in this area and would like to thank its members for their continued trust. The MDEP is really within the scope of the Agency's objectives and missions, assisting its member countries in pooling their technical expertise.

In fact, at the origin of the MDEP, the size of nuclear programmes worldwide, today with 65 reactors under construction, as well as the limited industry and regulatory resources were strong drivers for national regulators to pool their resources, to be more efficient. We don't know yet the impact of the Fukushima accident in new build, but to achieve harmonisation of designs and to arrive to an efficient design licensing process, will certainly help to face the new challenges ahead.

I believe your contributions in the MDEP Conference will be keys in improving the efficiency of the new reactor safety evaluation processes and the strategy of the MDEP in this regard. I also hope you will take all the possible benefit of this Conference and I wish you a good work.

I would like now to welcome Mr. André-Claude Lacoste, President of the French Nuclear Safety Authority and Chairman of the MDEP Policy Group. He has been at the outset of the MDEP initiative and he has provided excellent guidance and forethought to the MDEP organisation over the years. I leave the floor to him.

Thank you for your attention.

Welcome and opening of conference

André-Claude Lacoste, Chair, ASN
Chair, MDEP PG

General Information

MDEP Activities

Major Changes Since 2009

Perspectives and Challenges

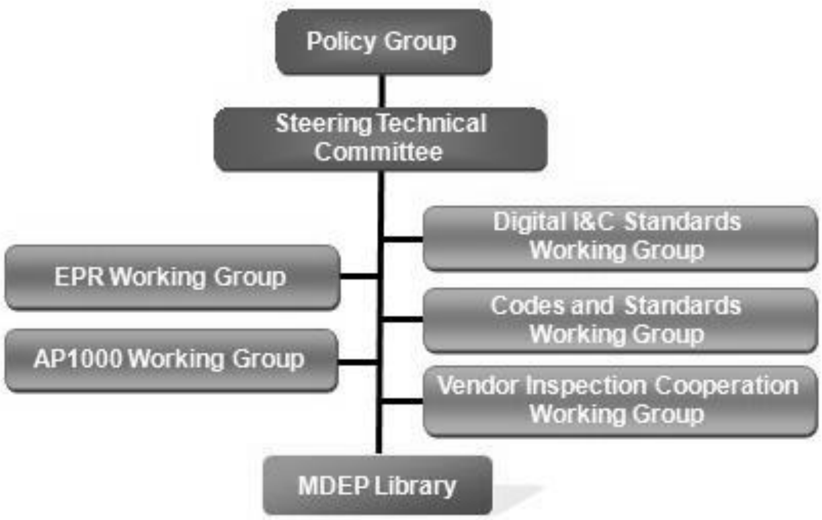
MDEP Membership

- **Current MDEP members:** Canada, China, Finland, France, Japan, Republic of Korea, Russian Federation, South Africa, the United Kingdom, and the United States
- **Terms of Reference** revised in Jan 2011 to define new categories for membership for potential MDEP expansion
  - MDEP Members
  - MDEP Associate Members
  - MDEP Candidates
  - Potential expansion of membership in discussion
- **NEA chosen to ensure the MDEP Secretariat**
- **IAEA takes part in the generic work of MDEP**

MDEP Expected Outcomes and Background Information

- To set up for an enhanced cooperation among regulators
- Proposed in 2005
- Initial two-year programme approved in 2007
- Converted into a long term programme in 2009 with a five-year planning window (2013) and expected interim results

MDEP Organization



Issue and Design Specific Working Groups

- **Issue Specific Working Groups**
  - To benefit from other regulators' experiences and to encourage harmonization in regulatory practices and requirements and in industry codes and standards
- **Design Specific Working Groups**
  - To share and cooperate on specific design evaluations and construction feedback regarding design-related issues

General Information

MDEP Activities

Major Changes Since 2009

Perspectives and Challenges

MDEP Working Group Activities

- **MDEP remains an effective and efficient expert network from different regulators**
  - Members' efforts maintained
- **Definition of comprehensive programmes of work for each WG**
  - Composed of short / medium / long term results
- **Increased interactions with industry stakeholders**

Design Specific Working Groups

- **EPR Working Group**

  Members: Finland , France, Canada, China, U.K., U.S.

- **AP1000 Working Group**

  Members: U.S., China, Canada, U.K.

Accomplishments

- Developed Common Positions (EPR Digital I&C design, AP1000 squib valves)
- Shared issues identified, questions to applicant, and drafts of evaluations
- Identified differences among various country designs
- Identified additional questions for applicants based on MDEP interactions

Issue Specific Working Group

Vendor Inspection Cooperation (VICWG)

- Performed approximately 30 witnessed and 1 joint inspections
- Developed Inspection Protocol for conducting inspections
- Compared quality assurance requirements used in the oversight of vendors

Digital Instrumentation and Control (DICWG)

- Developed DI&C common positions
- Obtained agreement from IEC and IEEE to increase cooperation and consider MDEP common positions

Codes and Standards (CSWG)

- Completed comparison of pressure boundary for Class 1 pressure vessels, piping, pumps, and valves in coordination with standards development organizations (SDOs)
- Obtained commitments in principle from SDOs to work together to minimize further divergence of code requirements

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General Information

MDEP Activities

Major Changes Since 2009

Perspectives and Challenges

MDEP Products

Common Positions

- **Design Specific Common Positions → Design Specific WGs**
  Each regulator responds independently to its applicant, taking the same position.
- **Generic Common Positions → Issue Specific WGs**
  Constitute best practices, recommended by MDEP members to IAEA and standards organizations.

- **There is no obligation for any regulatory body to follow them.**
- **If a regulatory body chooses to adopt a Generic Common Position, it is through that country's normal processes.**
- **The responsibility for regulatory decisions continues to be with the national regulator.**

MDEP Interactions

Efforts to communicate MDEP activities to key stakeholders

- **Non-MDEP Regulators**
  - NEA Committees : CNRA and CSNI
  - WENRA
- **International organizations**
  - IAEA (attends MDEP STC/PG and issue-specific working group meetings), GIF, EC
- **Industry**
  - Vendors, licensees, standards development organizations (ASME, JSME, AFCEN, CSA, NIKIET, KEA, IEEE, IEC, etc.), WNA and other industry organizations
- **Public**
  - Greater information displayed on MDEP public website www.oecd-nea.org/mdep

General Information

MDEP Activities

Major Changes Since 2009

Perspectives and Challenges

Fukushima

- **Issue discussed at the latest MDEP Policy Group and Steering Technical Committee meetings**
  - Programme of work to be defined as soon as first results from national safety assessments available
  - Interactions with other international organisations to be considered
  - High expectations from nuclear industry stakeholders

MDEP Enlargement

- **Membership**
  - New regulators asked for MDEP membership
  - ToR modified in advance in 2011 to manage their integration
- **Reactor Design**
  - Three regulators are needed for the creation of DSWG
  - Depending on regulators attending for membership, the creation of new DSWG should be discussed and anticipated by MDEP

Expectations from Industry Stakeholders

- **To achieve its goals MDEP needs :**
  - The active involvement of all stakeholders in MDEP activities : Regulators, Vendors and Operators
  - The industry stakeholder commitment for an enhanced international cooperation

SESSION 2 (PART I)

MDEP ACTIVITIES AND ACCOMPLISHMENTS ON DESIGN-SPECIFIC WORKING GROUPS (EPR AND AP1000 WORKING GROUPS)

SESSION 2 SUMMARY (PART I AND PART II)

The following participants made remarks and presentations on the status of the design-specific working groups on AREVA's EPR design (EPRWG) and Westinghouse Electric Company's AP1000 design (AP1000WG):

- Bo Tang, National Nuclear Safety Administration, China (NNSA), Deputy Director General, and Chair of Session 2, Part 1
- Petteri Tiippana, Finnish Radiation and Nuclear Safety Authority (STUK) and Chair of the EPRWG
- Gary Holahan, NRC, Deputy Director of the Office of New Reactors and Chair of the MDEP Steering Technical Committee (STC)

The following participants took part in the Panel Session on Design-Specific Activities after the presentations:

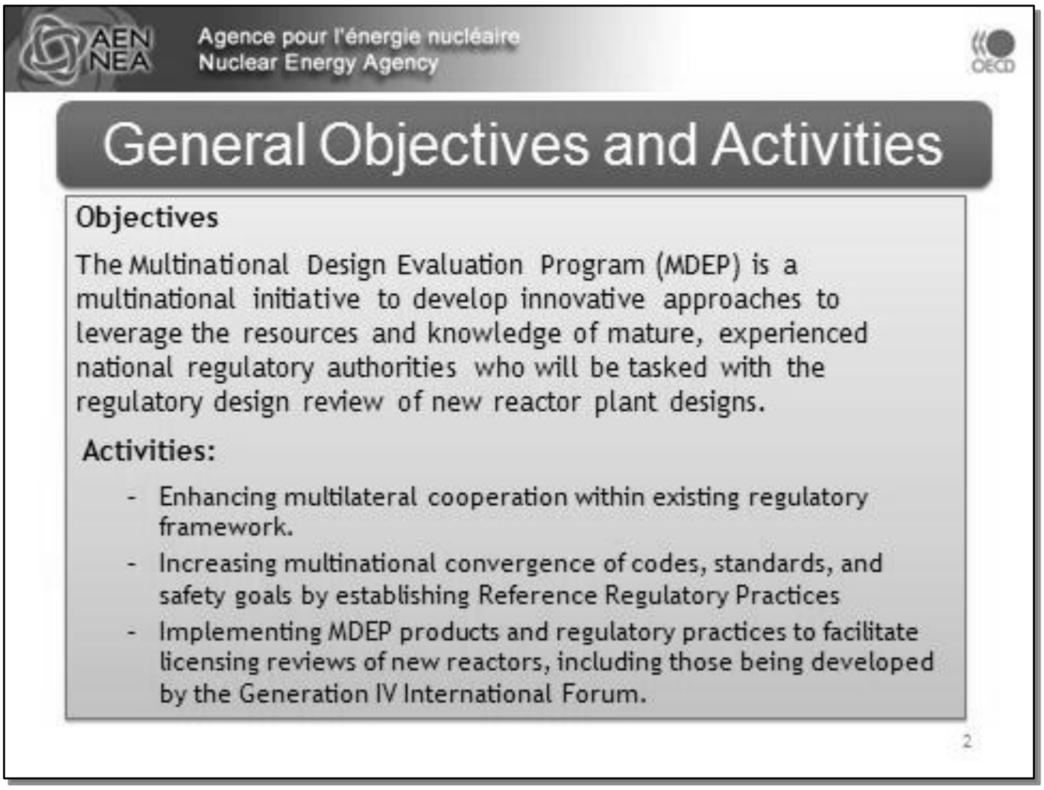
- Jukka Laaksonen, STUK, Director-General, MDEP Policy Group Member, and Chair of the Session 2, Part 2
- Thomas Houdré, French Nuclear Safety Authority (ASN), Director Nuclear Power Plants Department, Member of the STC
- Dave Newland, Canadian Nuclear Safety Council (CNSC), Director New Major Facilities Licensing Department, and Member of the STC
- Francois Bouteille, Senior Vice-President Safety & Licensing, AREVA
- Sandy Rupprecht, Vice-President AP1000 Product Delivery Systems, Westinghouse Electric Company
- Christopher Bakken, Project Director, Hinckley Point C Nuclear New Build, EDF Energy
- Dingjin Hu, Director, Taishan Nuclear Power Joint Venture Co. (TNPJVC) Paris Office

After the presentations by the chairs of the EPRWG and AP1000WG on the status and accomplishments of each working group, the Panel Session was conducted to discuss the activities that are going on pursuant to MDEP work on design-specific issues. Members of the panel included those from the regulators participating in MDEP as well as representatives from the companies who have designed and are licensing reactors in several MDEP countries. The Session 2, Part 2, Panel Chair, Mr. Laaksonen, provided brief introductory remarks and invited each panel member to say a few words about their views of MDEP design-specific activities. Each panel member discussed the role that their respective organisations are playing in licensing and constructing new reactors around the world. Some common themes emerged in these comments and in the questions and answers that followed. The industry representatives emphasised that they are embracing standardisation to address new reactor issues and they would hope and recommend that the regulators do also. Both Westinghouse and AREVA described their efforts in maintaining a standard design as much as possible to gain efficiencies in licensing, constructing, and operating new nuclear power plants worldwide. Some differences in designs may be driven by differing regulatory requirements or practices or perceptions of regulation requirements and practices by the licensees.

The MDEP representatives on the panel agreed that they do value standardisation for safety reasons and that, as part of the design-specific working groups, the MDEP participants are sharing documents and evaluations to help leverage resources and make licensing design reviews more safety focused. They thought that co-operation between diverse regulators can enhance safety and standardisation/harmonisation of regulations had the potential to enhance stability, predictability, and efficiency.

EPR Working Group

Petteri Tiippana, Chair of the EPRWG, STUK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OECD
General Objectives and Activities
Objectives
The Multinational Design Evaluation Program (MDEP) is a multinational initiative to develop innovative approaches to leverage the resources and knowledge of mature, experienced national regulatory authorities who will be tasked with the regulatory design review of new reactor plant designs.
Activities:
- Enhancing multilateral cooperation within existing regulatory framework.
- Increasing multinational convergence of codes, standards, and safety goals by establishing Reference Regulatory Practices
- Implementing MDEP products and regulatory practices to facilitate licensing reviews of new reactors, including those being developed by the Generation IV International Forum.
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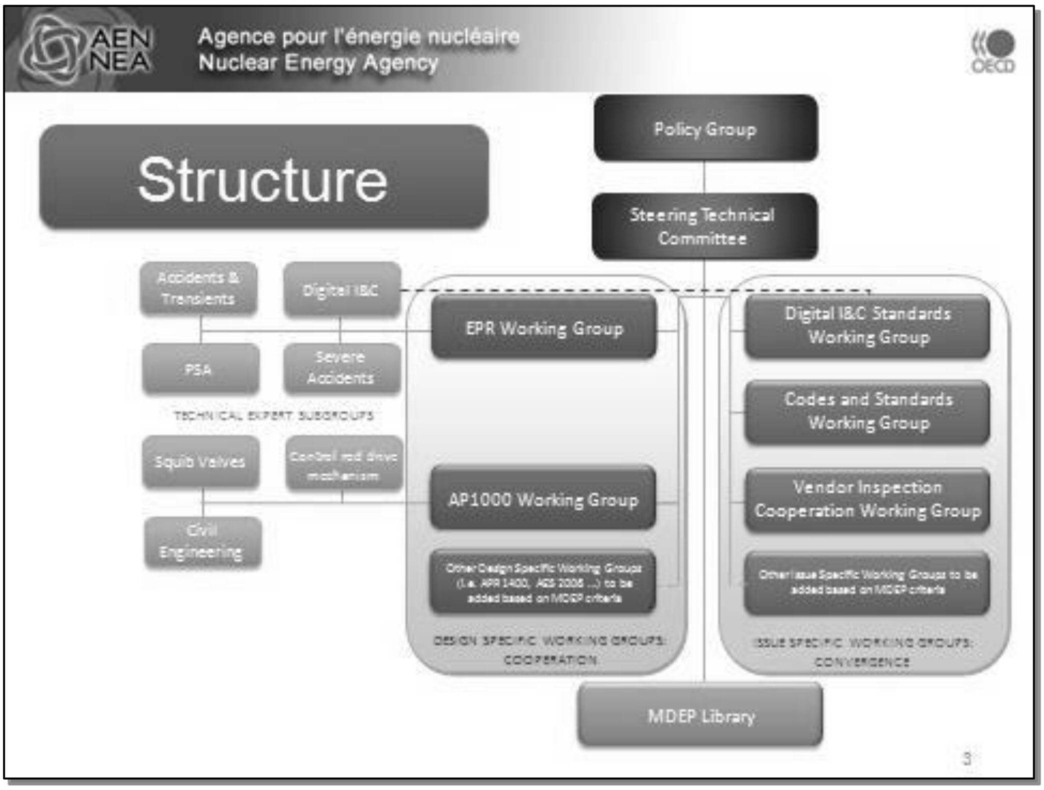
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OECD
Structure
Policy Group
Steering Technical Committee
Accidents & Transients
Digital I&C
PSA
Severe Accidents
TECHNICAL EXPERT SUBGROUPS
Squib Valves
Control rod drive mechanism
Civil Engineering
EPR Working Group
AP1000 Working Group
Other Design Specific Working Groups (i.e. APR 1400, AES 2006 ...) to be added based on MDEP criteria
DESIGN SPECIFIC WORKING GROUPS: COOPERATION
Digital I&C Standards Working Group
Codes and Standards Working Group
Vendor Inspection Cooperation Working Group
Other Issue Specific Working Groups to be added based on MDEP criteria
ISSUE SPECIFIC WORKING GROUPS: CONVERGENCE
MDEP Library
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Nuclear Energy Agency

EPR Working Group - Goals

- Goal of the MDEP EPRWG is to share information including assessments and experience on design reviews and construction oversight in order to
  - leverage the technical evaluations completed by each of the participating regulators
  - leverage the resources and knowledge of the national regulatory authorities
  - develop consistency between regulators and/or to understand differences
  - develop joint assessments on specific subjects
  - Make safety assessments more robust and increase the safety level of EPR

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EPR Working Group - General

- Members of EPR WG are regulators from:
  - Canada,
  - China,
  - Finland (chair),
  - France (co-chair),
  - United Kingdom,
  - United States
- Countries where EPR is being licensed or constructed
- Group has been meeting regularly since early 2008

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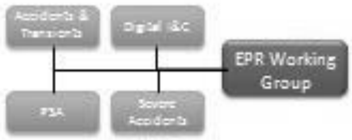
EPR Working Group - Activities

- General meetings on the status of each EPR project
  - discussions on the status of design review, construction
  - goal to identify new items for in depth discussions in the group
- Specific subgroups for
  - instrumentation and control
  - probabilistic risk assessment
  - accidents and transients
  - severe accidents
- Observed and Joint inspection efforts
  - Main coolant lines manufacturing, I&C design processes
- Issue specific ad hoc meetings, teleconferences
  - Internal hazards, radiation protection, human factors, grouted tendons, technical specifications, spent fuel cask loading device

OL3 July 2011, Source: TVO, Hannu Huovila



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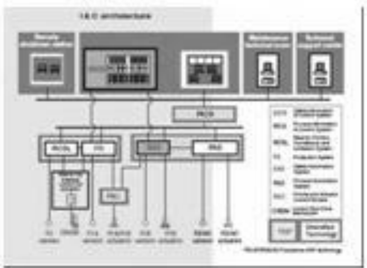
EPR Working Group - Instrumentation and Control

- Common position published in 2010 highlighting areas were harmonization/standardization can be further achieved
  - Simplicity as a design principle
  - Data communications independence
  - TELEPERM XS digital platform and software
  - Embedded digital systems
  - Back-up systems for defense-in-depth and diversity
- Some of the common positions and experiences were input to the MDEP Digital I&C Issue-Specific Group discussions



Source: Areva EPR Brochure March 2005

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Nuclear Energy Agency
OECD

EPR Working Group - PSA

- Comparison of EPR PSAs
  - main results and risk profiles
  - causes for differences & their risk significance
  - identification of potential issues
  - comparison report in 2012
- Internal and External events
  - adequacy of the provisions taken against internal and external hazards
  - layout and fire protection
- Co-operation with other subgroups
  - Modeling of I&C
  - Insights from Level 2 analyses, severe accidents

Source: Clipart

Source: Areva EPR Brochure March 2005

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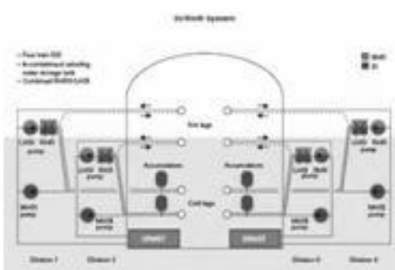
OECD

EPR Working Group - Accidents and Transients

- Activities ongoing within the following areas
  - Regulatory approaches and methodologies for accident analysis
  - Containment performance
  - Fuel and core design
  - Criticality safety
- Products are in the process of being finalized
  - Identifying Differences in Regulatory Criteria and Approaches
  - Containment circulation/mixing response evaluation
  - Mass and Energy Release in Containment



Source: Areva EPR Brochure March 2005

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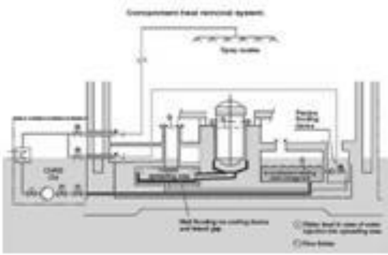
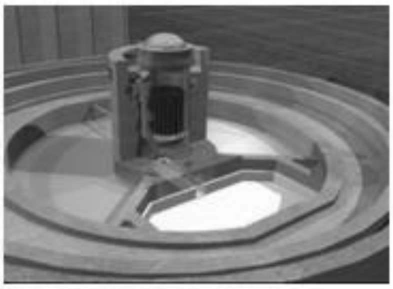
EPR Working Group - Severe Accidents

- Group has been working on
  - Hydrogen management in two room concept
  - Cooling functions and structures for molten core
  - Scope of severe accident instrumentation
  - Operating strategies for severe accidents
- Future topics include
  - Reactor pit composition
  - CHRS active flooding
  - Debris ingression into valves compartments
  - pH control in IRWST
  - Dual use of PDS (Feed and Bleed and SA)
  - Containment venting/filtration system issue





Source: Areva EPR Brochure March 2005

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EPR Working Group - Specific topics

- Meeting in May 2011 with Areva/EdF and involved utilities on EPR design differences
  - About 80 participants
  - Impacts of Fukushima accident were also discussed
- Other topics discussed
  - Internal hazards
  - Radiation Protection
  - Grouted tendons
  - Operational safety issues, Technical Specifications
  - Human factors engineering
  - Spent fuel cask loading device

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OECD

EPR Working Group - Accomplishments

- ✓ Sharing results of the design reviews
  - have resulted in identification of common safety concerns
  - have made national safety assessments more robust
  - have made it possible to understand differences in EPR designs
  - have helped participants to anticipate future issues
- ✓ Discussions on the design differences have resulted in
  - understanding of the differences in safety requirements
  - identification of harmonisation areas and design changes
- ✓ Observed and joint inspection efforts have enabled us to understand inspections techniques and methods employed by another regulator
- ✓ Networking the experts on different technical disciplines - easy to contact, ask questions, share concerns and information

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AP1000 Working Group

Gary Holahan, Chair of the STC, US NRC

U.S.NRC
United States Nuclear Regulatory Commission
Protecting People and the Environment

Status of AP1000 Reviews in Participating Countries

Country	Process	Status
China	Construction Permit	4 units under construction at Sanmen and Haiyang.
US	Design Certification	Proposed Rulemaking published Feb. 2011. Complete (final rule published) January 2012
UK	Generic Design Assessment	GDA Issues and Resolution Plans published July 15, 2011
Canada	Pre-project design review	not scheduled

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Protecting People and the Environment

Accomplishments

- Common Positions developed

- Squib valve qualification, testing, maintenance common position issued
- Guidelines for novel construction drafted

- Sharing of pre-lease versions of safety evaluations, etc.
- Design review documents stored in MDEP library (applications and design information, technical reports, questions to the applicant and answers, meeting presentations, etc.)
- Working relationships with counterparts facilitates communications

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U.S.NRC
United States Nuclear Regulatory Commission
Protecting People and the Environment

Expert Subgroups

- Squib Valves
  – Consensus reached on technical guidelines. Issued as Design Specific Common Position
- Civil Engineering
  – Continuing to develop technical considerations for innovative construction methods
- Control Rod Drive Mechanism
  – Issues include safety classification and testing

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U.S.NRC
United States Nuclear Regulatory Commission
Protecting People and the Environment

Next Steps

- Discussion of future plans, such as long-term Fukushima lessons-learned

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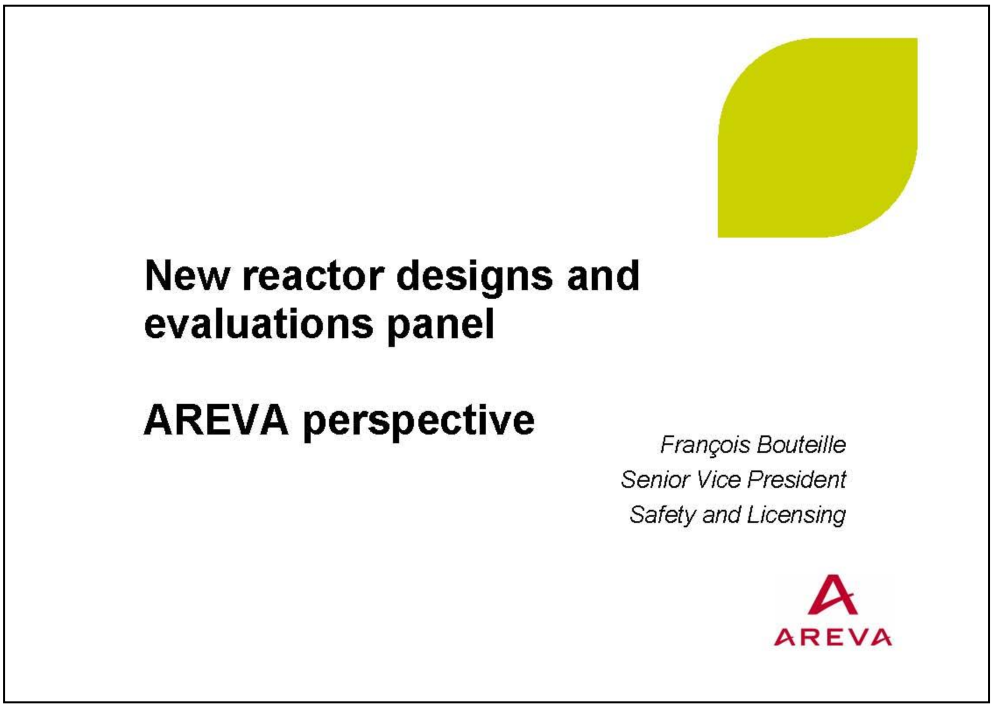
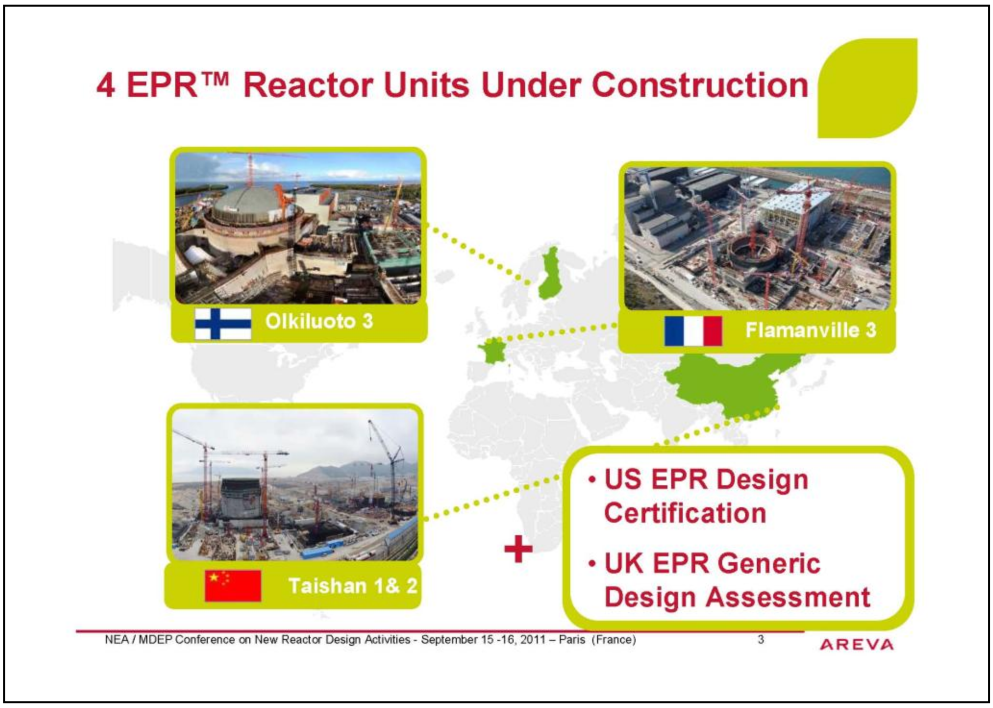
SESSION 2 (PART II)

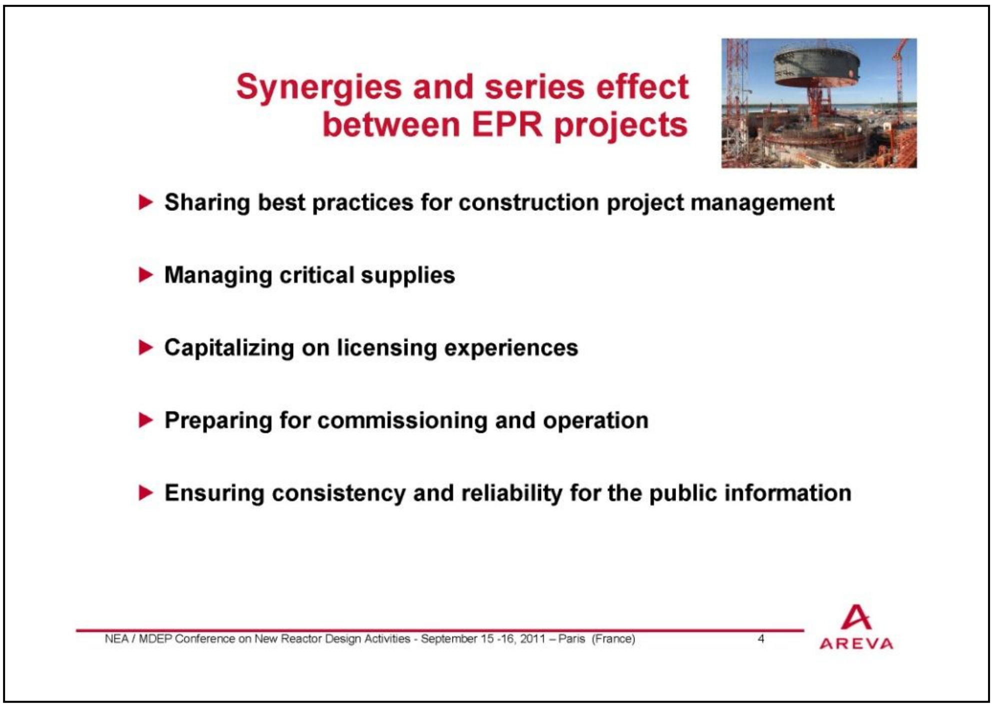
DESIGN-SPECIFIC ACTIVITIES PANEL

AREVA

François Bouteille, Senior Vice-President, Safety & Licensing




4 EPR™ Reactor Units Under Construction
Olkiluoto 3
Flamanville 3
Taishan 1& 2
+
• US EPR Design Certification
• UK EPR Generic Design Assessment
NEA / MDEP Conference on New Reactor Design Activities - September 15 -16, 2011 – Paris (France)
3
AREVA


Synergies and series effect between EPR projects
▶ Sharing best practices for construction project management
▶ Managing critical supplies
▶ Capitalizing on licensing experiences
▶ Preparing for commissioning and operation
▶ Ensuring consistency and reliability for the public information
NEA / MDEP Conference on New Reactor Design Activities - September 15 -16, 2011 – Paris (France)
4
AREVA

Harmonization of International Practices

- MDEP initiatives for harmonization of practices aiming at
  - Harmonizing regulatory frameworks
  - Harmonizing Codes and Standards
  - Sharing of resources and experience among regulators
- But efforts are still necessary to move towards mutual recognition mechanisms between nuclear regulators and international certification process
  - Reduction of uncertainties in licensing process
  - Homogeneous safety level worldwide
  - Facilitation for standardization of reactor designs
    - Licensable and constructible in every country with limited adjustments related to site specificities
- This work should be extended to manufacturing activities
  - Implementation of common international requirements for QA systems in the nuclear field, independent certification of QA systems recognized by "all"
  - Methodology for surveillance of manufacturing to be defined in common, then performed by a third party and recognized by all – with preparation of the corresponding file

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AREVA

EPR™ Standardized Design

- AREVA standard EPR™ concept combining
  - Reference design defined by technical features
  - Compliant with European Utilities Requirements
  - The unique AREVA licensing experience
  - Experience feedback from previous and current projects

- Replication of a sound basis with focus on specific adaptation studies
- Large scale effects for improved quality through stabilized industrial processes
  - AREVA manufactured primary components + subcontracted equipment
  - Reduction in lead time and construction durations
  - Possible anticipation of standard components' production
  - Strategic partnerships, qualification of local subcontractors to ensure a more dynamic response to market needs

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AREVA

Stabilized Industrial Process

- Experience acquired for the EPR main primary components manufacturing over the last decade allows
  - Definition of "Best Practices" for manufacturing
  - Definition of reference procedures and documents
  - For the whole set of components manufactured by AREVA
    - Large forged, molded and machined parts
    - Heavy components
    - Mobile components

Reactor Pressure Vessel – St-Marcel

» For an optimized manufacturing process meeting high-quality requirements, in particular for forging of large ingots

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AREVA

Quality and Safety Processes

- Nuclear safety requires no compromise on quality
  - From Design to in-service inspection
- Quality requirements
  - Applied to our own processes
  - Extended to our partners and contractors
  - All over the supply chain
- Development of safety culture internally and externally
- AREVA Qualification process for contractors and suppliers
  - Quality management
  - Awareness of responsibility
- International recognition of competence of AREVA's inspection body

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AREVA

Conclusion

- Mutual recognition mechanisms between safety regulators would benefit to safety worldwide
- Standardized reactor design, in particular for forgings,
- It would facilitate the deployment of large fleets of standardized reactors
- With possible anticipation of standard components' manufacturing without allocation to a contract

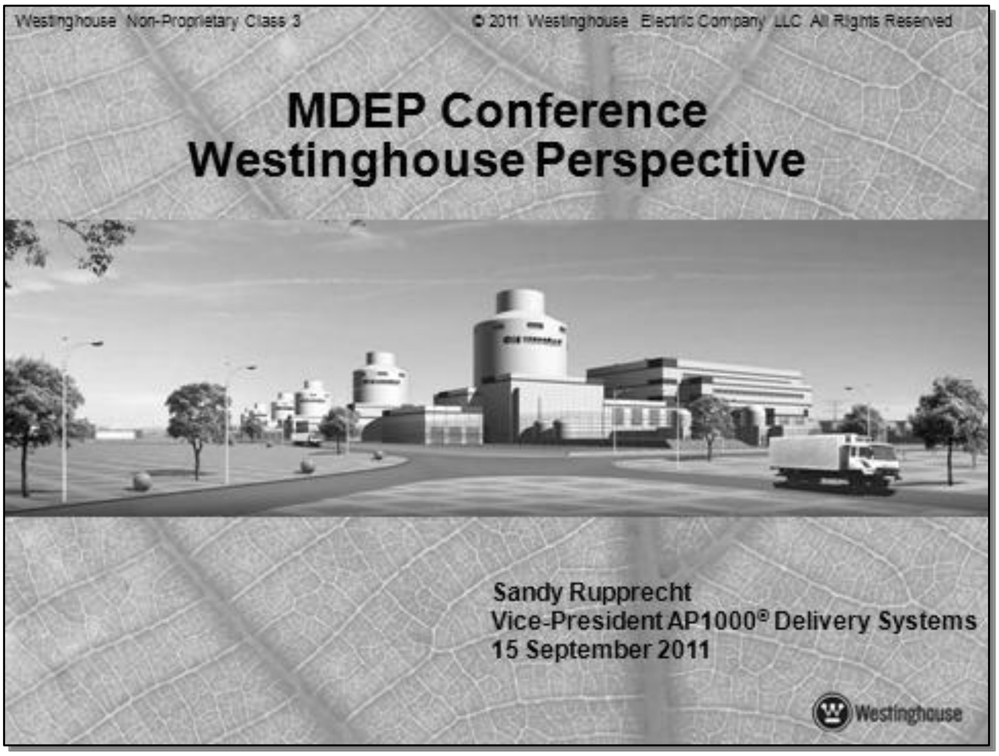
EPR™ reactor construction site, Olkiluoto (Finland). 2011, July

AREVA is supporting MDEP work to strengthen its organization

NEA / MDEP Conference on New Reactor Design Activities - September 15-16, 2011 – Paris (France) 9 AREVA

Westinghouse

Sandy Rupprecht, vice-president AP1000 product delivery systems



AP1000® Global Regulatory Engagement

- China
- United States
- United Kingdom
- India

Westinghouse

Regulatory Framework

- Nuclear Industry needs a regulatory framework that is :
  - Strong, credible, and transparent
  - Stable, predictable, and efficient
  - Standardized/harmonized

- MDEP objectives generally support those needs :
  - Leverage global cooperation
  - Harmonized regulatory practices and requirements while retaining sovereign authority

Westinghouse

Feedback

- Positives
  - Cooperation between diverse regulators enhances safety
  - Standardization/harmonization of regulations has the potential to enhance stability, predictability, and efficiency
- Areas for Improvement
  - Accurate and complete sharing of information
  - Vendor participation
  - Regulating innovative technology

4 Westinghouse

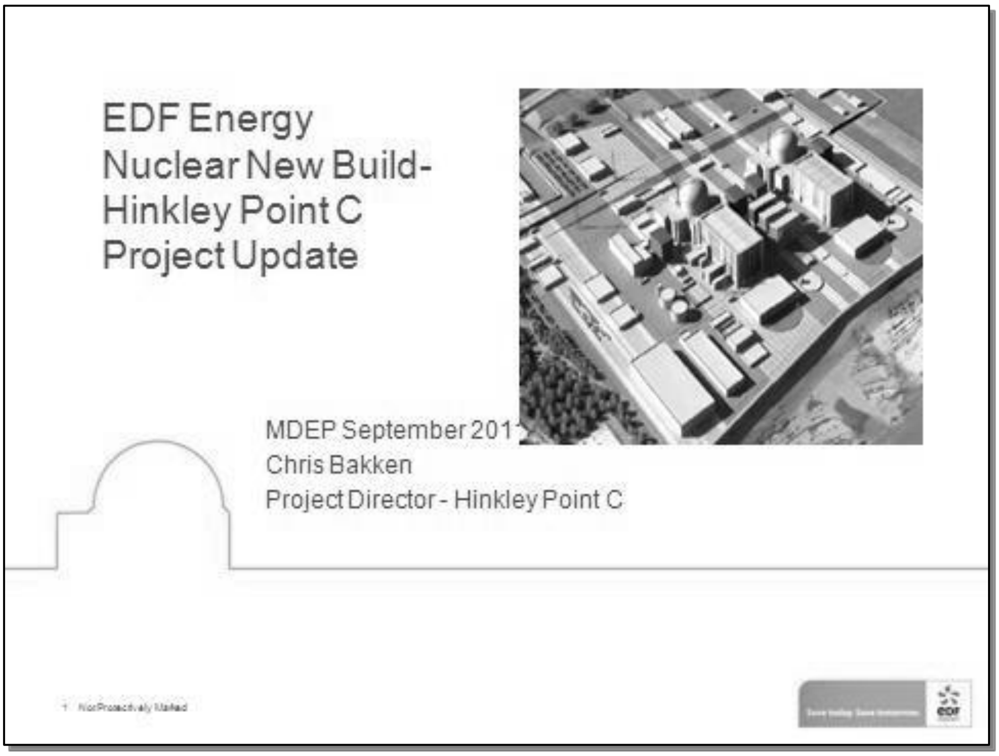
Thank You

AP1000

5 Westinghouse

EDF Energy

Christopher Bakken, Project Director – Hinkley Point C



The Hinkley Point C Story So Far…..

2011 has been a productive year for NNB GenCo

- Positive Government position on Energy Market Reform
- Continued positive Government support on Nuclear as a key part of the energy portfolio mix
- Confidence building in a GDA Interim Design Acceptance Certificate – ONR and industry prudently dealt with the opportunity for Fukushima lessons learned
- Local Planning Permission granted for site levelling and preliminary works
- Order for long lead NSSS forgings placed with Areva
- Contractors are now working on site remediation and in preparation for preliminary site works

Applications made in 2011 by NNB GenCo

- Nuclear Site Licence
- Radiological Discharge Permits
- Combustion Activity Permits
- Water Discharge Activity Permits
- Full Infrastructure Planning Commission application imminent

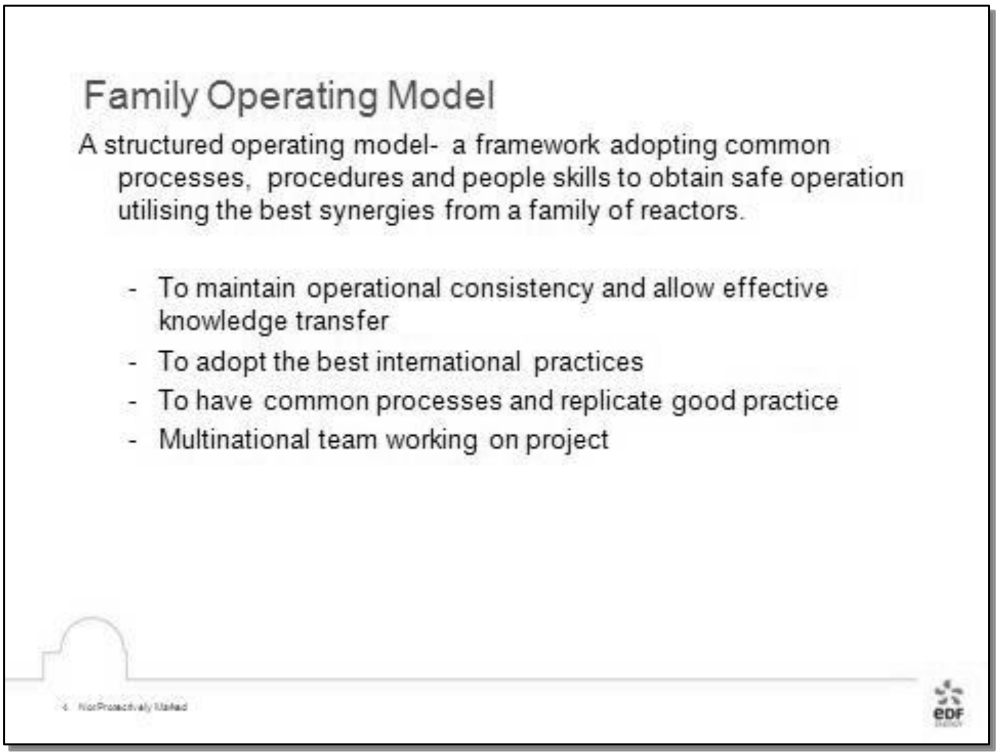
EPR Family Experience

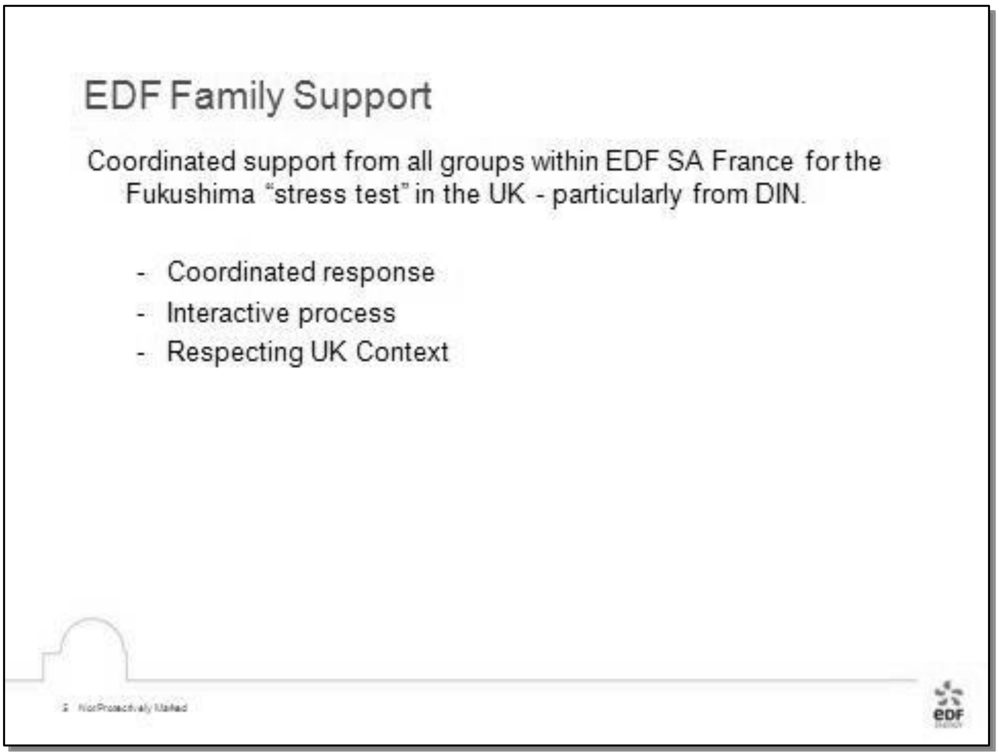
Experience transfer from;

- Flamanville 3
- Taishan
- Calvert Cliffs 3
- Olkiluoto

Examples of lessons learned so far;

- Project organisation
- Construction sequencing
- Contracting strategy
- Design & Licensing

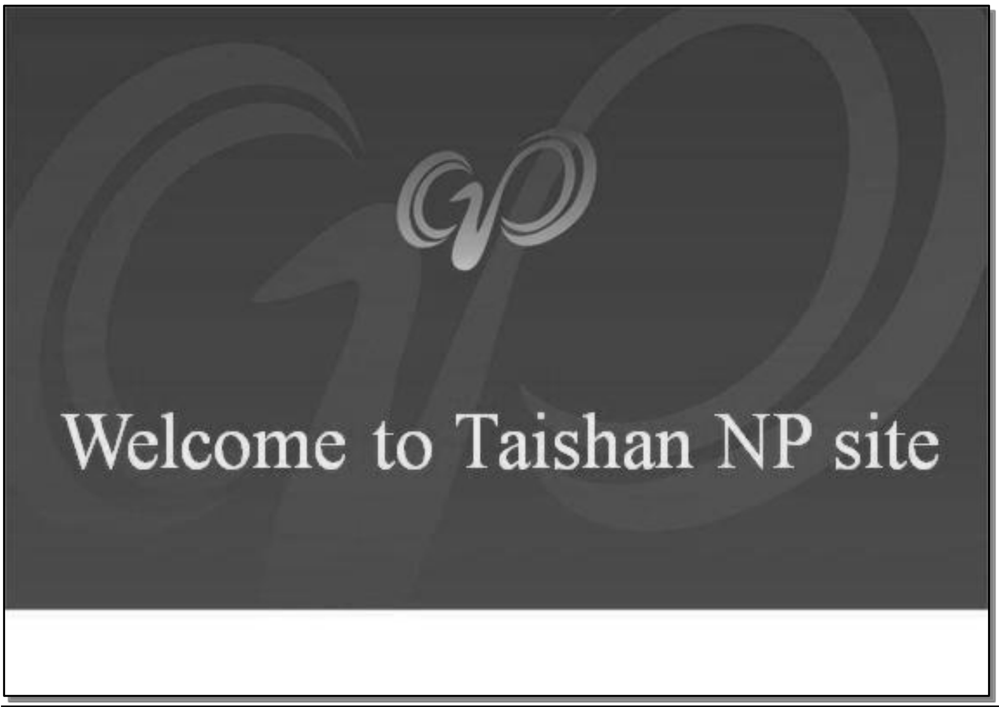

Family Operating Model
A structured operating model- a framework adopting common processes, procedures and people skills to obtain safe operation utilising the best synergies from a family of reactors.
- To maintain operational consistency and allow effective knowledge transfer
- To adopt the best international practices
- To have common processes and replicate good practice
- Multinational team working on project
EDF


EDF Family Support
Coordinated support from all groups within EDF SA France for the Fukushima "stress test" in the UK - particularly from DIN.
- Coordinated response
- Interactive process
- Respecting UK Context
EDF


Respectful Of UK Regulation
• UK Licensed organisation (NNB GenCo)
- 36 licence conditions
• Directors have personal legal responsibilities
• Licensed organisation must be an intelligent customer
• EDF DIN will be our Architect Engineer and will provide a significant portion of the construction and engineering support
• Overall control must remain however with the licensed organisation NNB to satisfy UK regulatory requirements
• Benefit from the EPR Family Experience
EDF

TNPJVC

Digjin Hu, Director, TNPJVC, Paris Office



台山核电 TNPJVC 建设国际一流三代核电标杆工程

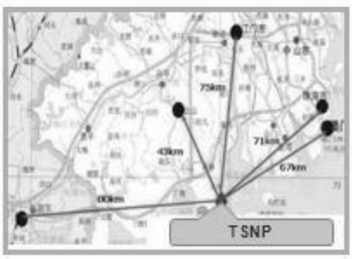
Content

Project Introduction → Project Progress → Main Tasks in 2011

台山核电 TNPJVC 建设国际一流三代核电标杆工程

Site Conditions

- TSNP is situated at Yaogu village of Chixi town in Taishan city, Guangdong province, 70km, 80km and 40km respectively away from Zhuhai, Yangjiang and Taishan.



台山核电 TNPJVC 建设国际一流三代核电标杆工程

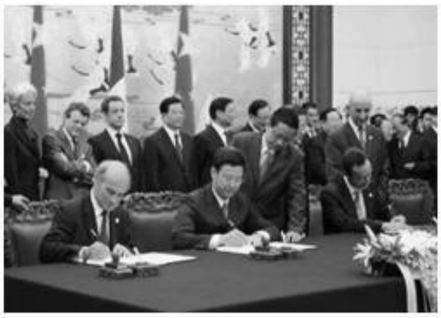
Site Conditions

- Construction of unit 1 commenced on Oct 26th 2009, and the unit is expected to be put into commercial operation in Dec., 2013. The unit 2 schedule is 10 months gap with unit 1.

台山核电 TNPJVC 建设国际一流三代核电标杆工程

Project Introduction

- On Nov. 26th, 2007, and under the witness of presidents of both China and France, CGNPC signed, at the Great Hall of the People with EDF and AREVA, cooperation agreements over constructing the Taishan EPR project.



台山核电 TNPJVC 建设国际一流三代核电标杆工程

Project Introduction

- In Dec. 21st, 2009, Vice Premier Li Keqiang and French Prime Minister Francois Fillon inaugurated the Taishan Nuclear Power Joint Venture Co., Ltd.

台山核电 TNPJVC 建设国际一流三代核电标杆工程

Company Introduction

- Taishan Nuclear Power Joint Venture Co. Ltd. (TNPJVC) is invested and established by CGNPC and EDF. TNPJVC is mainly responsible for the financing, construction, operation and management of Taishan Nuclear Power Station Phase I project, and the ultimate responsibility of nuclear Safety.
- Taishan Nuclear Power Joint Venture Co., Ltd. is invested by CGNPC and EDF, and proportion is 70% and 30% respectively.

台山核电 TNPJVC 建设国际一流三代核电标杆工程

Cooperation in Construction

Taishan Project follows a mode of Sino-foreign cooperation in construction with engineering of nuclear power plant and manufacturing of equipment under co-responsibilities of Sino-French enterprises.

- Consortium of AREVA, CNPEC and CNPDC leaded by AREVA is responsible for supply and engineering contracts of NI.
- Consortium of ALSTOM and DEC is responsible for engineering and procurement contracts of TG.
- Other parts of construction are under the responsibilities of domestic enterprises.

台山核电 TNPJVC 建设国际一流三代核电标杆工程

Task Sharing

Equipment	Unit 1	Unit 2
RPV	Mitsubishi Heavy Industries (MHI)	DEC
SG	Chalon (France)	DEC / SEC
Pressurizer	Chalon (France)	DEC
Reactor internals	SKODA (Czechoslovakia)	SEC
CRDM	Jeumont (France)	Jeumont (France) / SEC
Primary pump	Jeumont (France) / DEC	Jeumont (France) / DEC
Heavy supports	DEC	DEC

Note: NI Primary Equipment localization ratio reaches 50%.

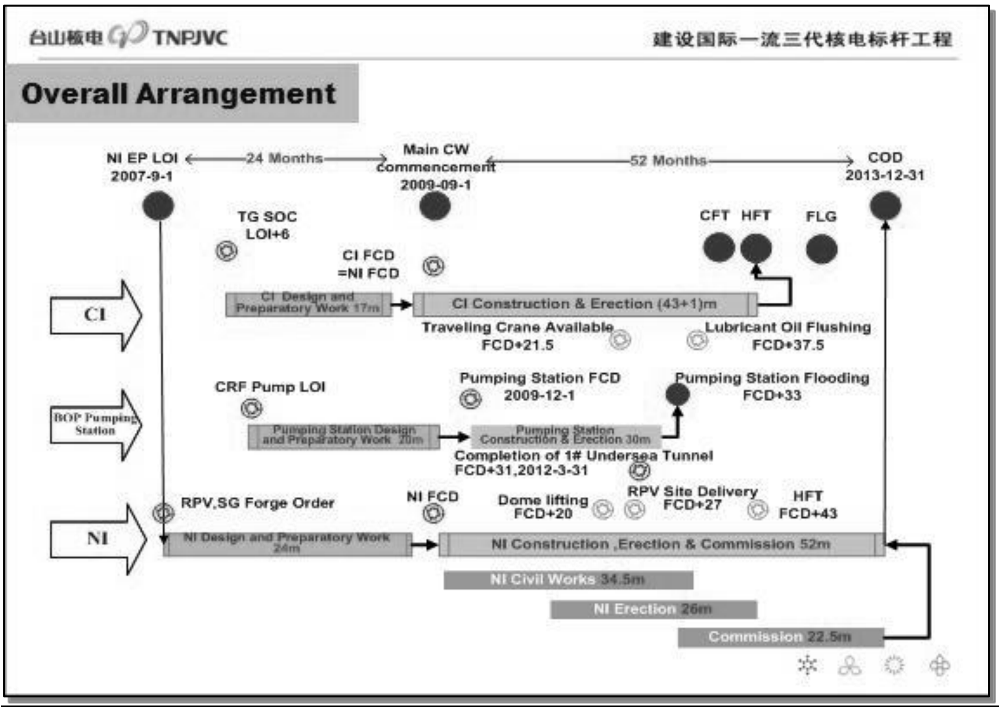
In the charge of overseas company; Sino-foreign joint cooperation;

In the charge of domestic company.

Equipment	Unit 1	Unit 2
HP/MP cylinder	ALSTOM/DEC	DEC
1# LP cylinder	ALSTOM/DEC	DEC
2# LP cylinder	DEC（rotor welding excluded）	DEC
3# LP cylinder	DEC（rotor welding excluded）	DEC
Generator rotor	DEC（coil excluded）	DEC
Generator stator	DEC（wedge slot excluded）	DEC
Exciter	DEC	DEC

Note: for the Turbine generator units engineering and procurement, the share of Chinese companies accounts for 2/3.

Sino-foreign joint cooperation; In the charge of domestic company.



台山核电 TNPJVC 建设国际一流三代核电标杆工程

Completion status of Level 1 Milestones

SN	Millstones	Unit 1#		Unit 2#	
		Planned Date	Completed Date	Planned Date	Completed Date
1	Signature of NI EP contract	2007-11-26	2007-11-26	–	–
2	Signature of TGP contract	2008-02-28	2008-02-28	–	–
3	NI FCD	2009-09-01	2009-10-26	2010-07-01	2010-04-15
4	CI FCD	2009-09-01	2009-09-01	2010-07-01	2010-03-13
5	HPX FCD	2009-12-01	2009-11-26	–	–
6	TG pedestal start construction	2010-02-01	2010-01-15	2010-12-01	2010-09-01
7	NI erection start (HL* pipeline)	2010-11-01	2010-11-01	2011-09-01	
8	Demineralized water production system (SDA) commissioning start	2011-06-15	2011-06-15	–	–

台山核电 TNPJVC　　建设国际一流三代核电标杆工程

Project Design

- 1# turbine hall CW drawings issuance basically completed.

Image progress of 1#HM design

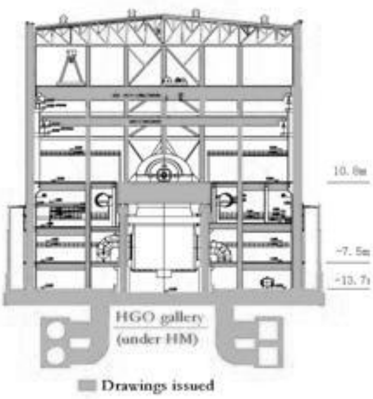
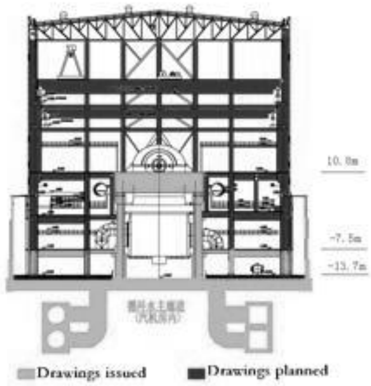


Image progress of 2#HM design



台山核电 TNPJVC　　建设国际一流三代核电标杆工程

Equipment Manufacture

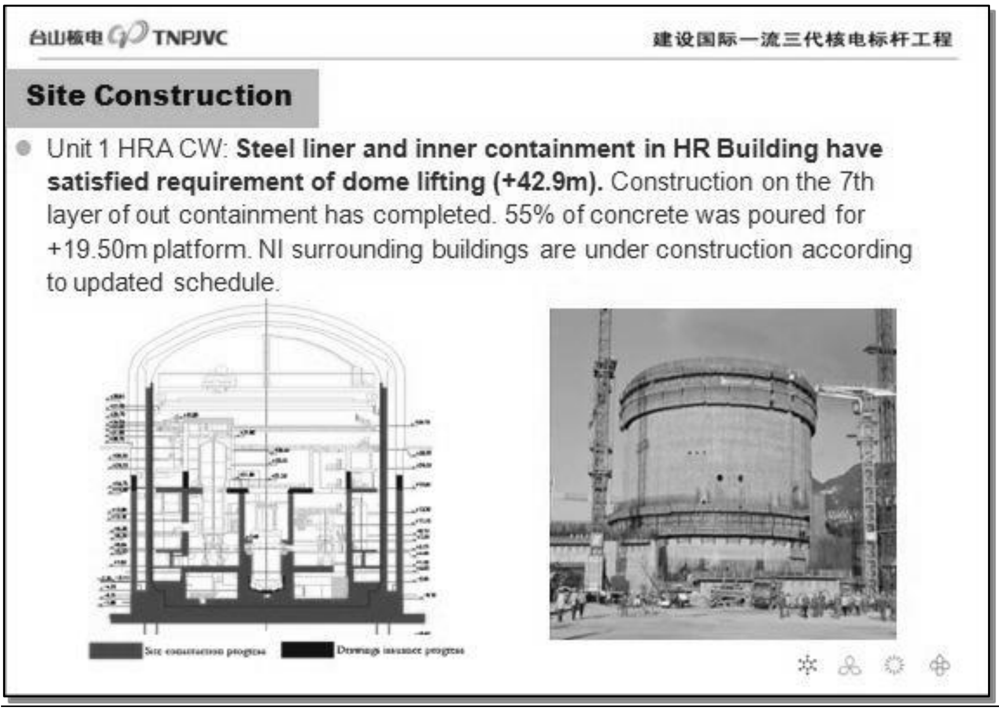
- Main equipments for unit #1 and #2 are under process of manufacture. Quality and progress are controllable.
- CI and BOP auxiliary equipment manufacture is basically in normal progress.

Unit #1 Reactor Pressurize Vessel- Mitsubishi Japan

Unit #1 Steam Generator –Chalon France


台山核电 TNPJVC
建设国际一流三代核电标杆工程
A Bird-eye View of the Site


台山核电 TNPJVC
建设国际一流三代核电标杆工程
A Bird-eye View of Unit 1

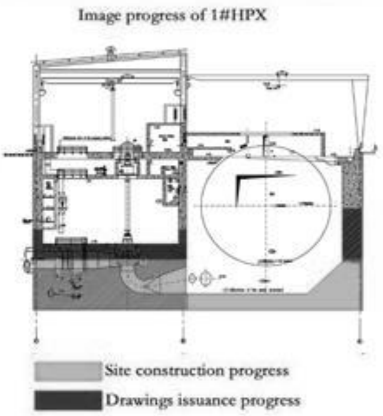

台山核电 TNPJVC
建设国际一流三代核电标杆工程
Site Construction
Unit 1 HRA CW: **Steel liner and inner containment in HR Building have satisfied requirement of dome lifting (+42.9m).** Construction on the 7th layer of out containment has completed. 55% of concrete was poured for +19.50m platform. NI surrounding buildings are under construction according to updated schedule.
Site construction progress
Drawings issuance progress


台山核电 TNPJVC
建设国际一流三代核电标杆工程
Site Construction
Unit 1 CI CW: HM raft has been completed. Retaining wall and steel structure are under construction; central support of TG pedestal has been completed. Construction starts for the operating platform.
Site construction progress
Drawings issuance progress

台山核电 TNPJVC　　建设国际一流三代核电标杆工程

Site Construction

- Unit 1 HPX CW: Construction has been completed for the volute in pump house, -13.75m to -10.5m raft is under construction; the drum screen raft and up to -10.5m wall are completed.

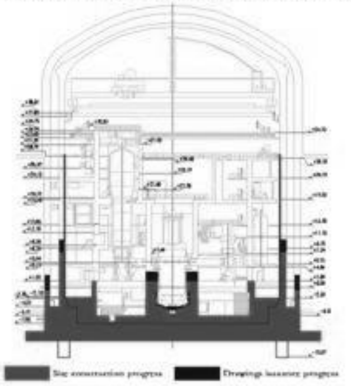


台山核电 TNPJVC　　建设国际一流三代核电标杆工程

台山核电 TNPJVC 建设国际一流三代核电标杆工程

Site Construction

- Unit 2 HRA CW: The 6th layer of steel liner cylinder is lifted, the 2nd layer of outer containment and 4th layer of inner containment are completed; 80% of -2.30m ~ +1.50m spreading area in internal structure is completed; rebar binding is being carried out in -2.30m non-spreading area.

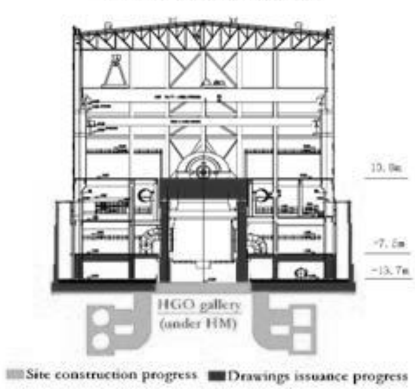


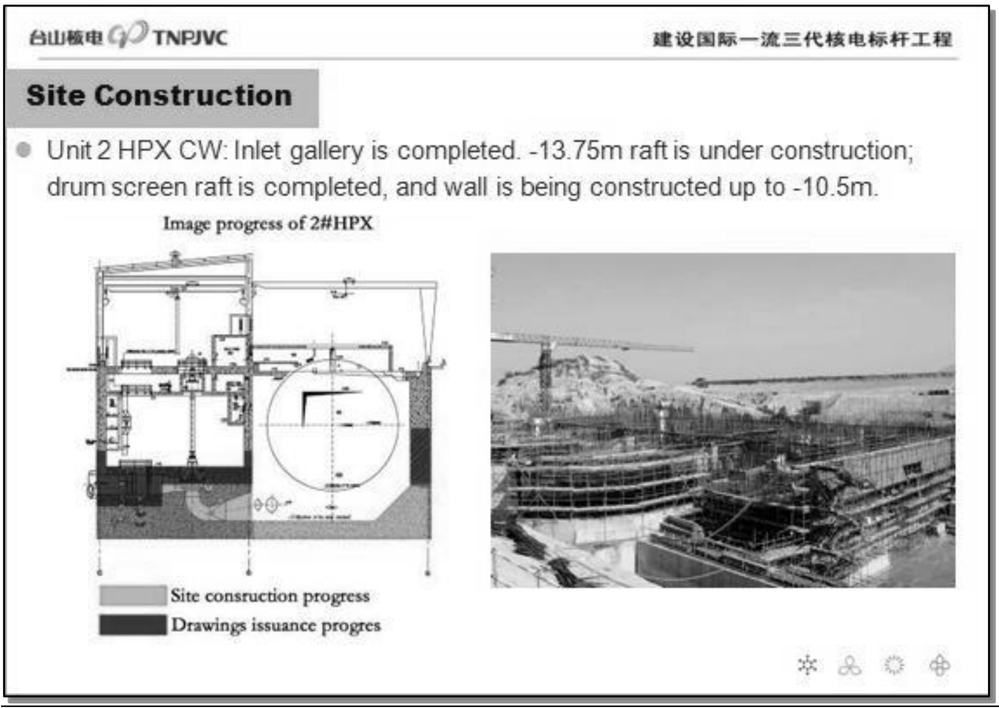
台山核电 TNPJVC 建设国际一流三代核电标杆工程

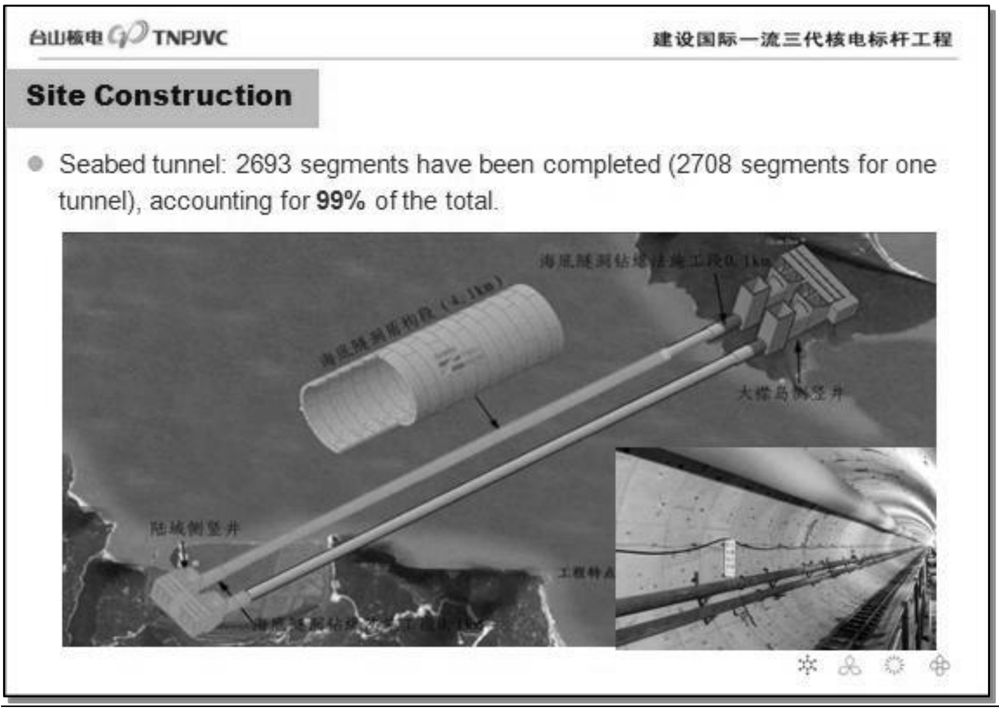
Site Construction

- Unit 2 CI CW: Pressurizing test and backfilling are completed for HGO gallery in HM. **HM raft and TG pedestal are under construction**.

Image progress of 2#HM




台山核电 TNPJVC
建设国际一流三代核电标杆工程
Site Construction
Unit 2 HPX CW: Inlet gallery is completed. -13.75m raft is under construction; drum screen raft is completed, and wall is being constructed up to -10.5m.
Image progress of 2#HPX
Site consruction progress
Drawings issuance progres


台山核电 TNPJVC
建设国际一流三代核电标杆工程
Site Construction
Seabed tunnel: 2693 segments have been completed (2708 segments for one tunnel), accounting for **99%** of the total.
陆域侧竖井

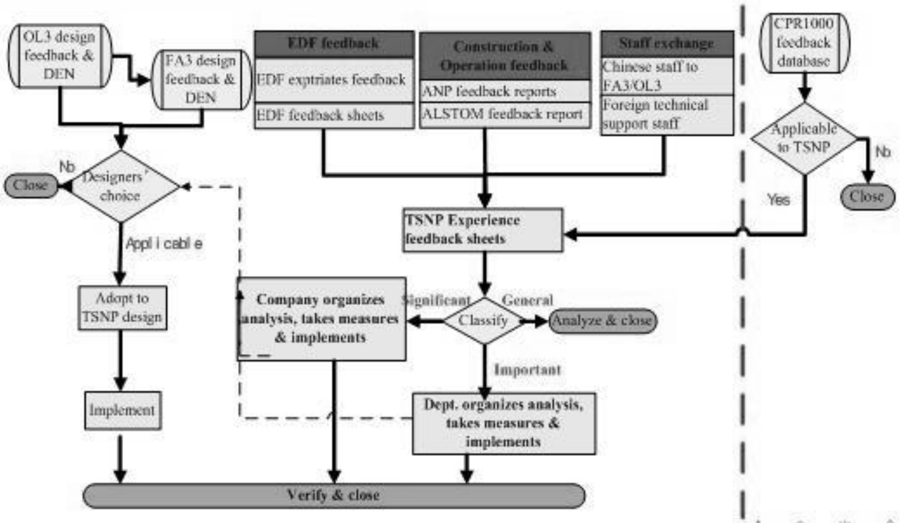
台山核电 TNPJVC 建设国际一流三代核电标杆工程

Erection and Commissioning

- Erection in NI was carried out on schedule on November 1st, 2010. 105102 points of erection has been done up to now.
- The commissioning organization was established in February of 2011 and has started its operation. On June 15th 2011, commissioning was carried out on schedule for the first processing system (SDA1).

台山核电 TNPJVC 建设国际一流三代核电标杆工程

Experience Feedback



台山核电 TNPJVC 建设国际一流三代核电标杆工程

Technology Innovation

- As the third EPR project in the world, Taishan Project referred to the experience from previous two projects, organized meticulously and overcame technical difficulties happened in construction, carried out innovative construction process such as **mass concrete placing and modular construction** in NI steel liner, created healthy experience for nuclear power construction in China.

台山核电 TNPJVC 建设国际一流三代核电标杆工程

Utilization of advanced construction techniques

- **Mass concrete single lift pouring**

The mass concrete was placed as a single lift, and is very successful. 9200m3 concrete was poured at one time for NI raft; 5600m3 concrete was poured at one time for TG pedestal foundation.

TSNP phase I NI raft concrete pouring

台山核电 TNPJVC 建设国际一流三代核电标杆工程

Utilization of advanced construction techniques

- **Steel liner modularized lifting and erection technique**

1# NI steel liner module No. 1 was successfully lifted on Mar.20th 2010. The top diameter and bottom diameter of this module is respectively 46.8m and 44.96m, with a height of 5m and a deadweight of 78t. The total weight of grid lifting device, module and lifting rigs amounts to approx.115t. A series of momentous technique innovations such as the use of grid lifting device and crawler crane travelling under 800t load.

台山核电 TNPJVC 建设国际一流三代核电标杆工程

Project Coordination Mechanism

- Top Management Coordination: In order to build a world-class nuclear power station in TSNP, CGNPC impelled main construction parties of TSNP (CNECC, CSCEC, DEC, Shanghai Electric, AREVA, EDF and ALSTOM) to establish top management coordination mechanism, negotiated and proposed benchmarking project guideline, coordinated regularly for solutions of important issues.
- Dedicated Coordination Mechanism: Regular coordination mechanism was established for critical paths and difficulties in project construction. Top management of owner and contractor participate and push forward dedicated task.
- Main Contract Coordination Meeting: Coordination meetings are held for difficulties and problems happened in implementation of design and supply contract for NI & CI , and in technical preparation and organization of NI construction.

台山核电 TNPJVC 建设国际一流三代核电标杆工程

Project Coordination Mechanism

台山核电 TNPJVC 建设国际一流三代核电标杆工程

EPR Showcase Project Indicators

- Statistics for the Implementation Status of Taishan EPR Showcase Project Indicators (Up to the end of June of 2011)

Field	Result Indicator	status
Safety control	Mortality rate per100,000 persons = 0	0
	Rate of safety accident per 200,000 man-hours ≤0.06	0.0302
	Fire accident (times)= 0	0
Quality control	Rate of implementation of experience feedback from major quality events of other EPR project under construction	100%
	Recurrence of Major quality events in other EPR projects under construction = 0	0

台山核电 TNPJVC 建设国际一流三代核电标杆工程

EPR Showcase Project Indicators

Field	Result Indicator	status
Schedule control	Rate of on-schedule achievement of level I project milestones = 100%	100%
	Rate of on-schedule achievement of level II engineering milestones ≥ 80%	75%
	Rate of on-schedule achievement of level II construction milestones ≥ 85%	70%
Cost control	Overall cost of the project (cost of completing the project) ≤ approved overall budget.	meet the requirement

- Note: the green color stands for meeting requirement or implementing smoothly as required by the indicators; the yellow color stands for slightly deviating from the indicator but no great impact; the red color stands for great deviating from the indicator and needs attention.

台山核电 TNPJVC 建设国际一流三代核电标杆工程

Level 1 Milestones in 2011

SN	Level 1 Milestones	Scheduled target
1	1#NI dome lifting	--
2	1#RPV delivery	2011-11-30
3	1#NI polar crane available	2011-12-15
4	2#NI erection start	2011-09-01
5	1#CI main traveling crane available	2011-12-15
6	1#turbine LP2 module delivery	2011-10-15

SESSION 3

MDEP ACTIVITIES AND ACCOMPLISHMENTS OF THE DIGITAL INSTRUMENTATION AND CONTROL WORKING GROUP (DICWG)

SESSION 3 SUMMARY

Mr. Petteri Tiippana, Finland STC member, STUK, chaired this session. The following persons made remarks and/or gave presentations on the status of the issue-specific working groups on Digital Instrumentation and Control (DICWG):

- Dan Santos, US NRC, chair of the DICWG, gave a presentation of the current status of the DICWG work and its perspectives;
- Jean-Paul Bouard, International Electrotechnical Commission (IEC), IEC SC45A secretary, gave a presentation of the IEC and nuclear I&C standards;
- Kook Hun Kim, vice-president of Doosan Heavy Industries and Construction, gave a presentation of Doosan and their work on DI&C;
- Bob Jennings, Office for Nuclear Regulation (ONR), UK STC member, made remarks on some issues in digital I&C system design from the perspectives of both the MDEP STC member and the UK regulator.

Included in the presentation regarding the DICWG work was the current status of the thirteen common positions, three of which were published on the NEA's MDEP public website: on simplicity, software tools and communications. Close interactions were achieved with IEC, the Institute of Electrical and Electronics Engineers (IEEE) and the International Atomic Energy Agency (IAEA) to maximise the improvement and the convergence of digital instrumentation and control standards regarding the DICWG positions.

The IEC representative presented the overall IEC background, highlighting the high number of countries participating in their work and the wide range of topics covered. He also mentioned that the interactions of the international entities with the MDEP demonstrated the effort toward the harmonisation of I&C standards.

The Doosan representative gave a description of its experience in digital instrumentation and control in terms of R&D projects and manufacturing of the reactors under construction. He concluded with stating the benefits of setting up common regulatory positions and the negative consequences of divergences of standards.

Bob Jennings mentioned the importance of operational profile on the performance of I&C system, and also stressed the importance of safety classification issue. He concluded his remarks with acknowledgment of the benefits from the contributions made by the US on AP 1000 as well as the contributions by Finland and France on EPR.

There were questions and answers between the audience and panelists on the following: MDEP initiatives for safety classification issue; possibility of common position on integrity of supply chains of digital I&C components; efforts to develop standards to capture a new technology; verification of software reliability during operational phase.

As to the safety classification issue, MDEP's input to draft IAEA safety guide dealing with the issue was mentioned. The DICWG's on-going efforts to establish common positions on integrity of digital I&C components, software reliability throughout life cycle, and new technologies was addressed. In terms of setting safety guides on new technologies, it was noted that the MDEP common positions, unlike SDOs' detailed technical standards, were fundamental safety principles in nature.

Digital Instrumentation and Control Working Group

Dan Santos, Chair of the DICWG, US NRC

Overview of DICWG

- Current Members
  - Canada, China, Finland, France, Japan, Republic of Korea, Russian Federation, South Africa, United Kingdom, and the United States
- Collaboration with
  - IAEA
  - IEC
  - IEEE
- NEA providing technical secretariat support

2

DICWG MEMBERS

3

NEA
Nuclear Energy Agency

DICWG MEMBERS

OECD 50

CHUN, Gilbert De VOS, Marcel LOJK, Robert NEWLAND, David	Canada	BESTER, Peter PETLANE, Bernard P. ROKITA, Slavek	South Africa
FU, Jie HAO, Xiaofeng WANG, Zhongqiu YIN, Dejian	China	JENNINGS, Bob TATE, Richard YATES, Bob	United Kingdom
JOHANSSON, Mika VALTONEN, Keijo WAHLSTROM, Kim	Finland	ZHANG, Deanna SANTOS, Daniel **(Chair)** WILLIAMS, Donna ASHCRAFT, Joseph	United States
BRONSART, Philippe GASSINO, Jean REGNIER, Pascal	France	JOHNSON, Gary	IAEA
ITO, Juichiro NAGAE, Hiroshi TAKITA, Masami KAWAGUCHI, Ken	Japan	BOUARD, Jean-Paul	IEC
JI, Seong Hyun	Republic of Korea	AGGARWAL, Satish	IEEE
GONCHUKOV, Victor GRISHMANOVSKAYA, Anna KLOPKOV, Valery	Russian Federation	BURKHART, Lawrence KIM, Byung Soon	NEA

4

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Key Objectives

OECD 50

- Enhance regulatory cooperation
- Identify similarities and differences
- Make progress towards harmonization/convergence of standards
- Development of generic common positions to address issues related to DI&C systems

5

Accomplishments

- Published three positions on Simplicity, Software Tools, and Communications
- Identified and progressing on 10 other positions
- Correspondence to IEC and IEEE identifying common issues
- Provided feedback at the IEEE Nuclear Power Engineering Committee (NPEC) for 4 potential new IEEE standards
- Performed study of the various I&C safety classifications
- Established and maintain the MDEP library for the DICWG

Quick Inquiries

- A structured and efficient method for soliciting and sharing of expert knowledge, regulatory documents, operating experience and lessons learned
- Facilitate identification of new generic common positions

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DICWG Common Positions

OECD 50

Generic Common Positions	Lead
1. Software Common Cause Failures in Safety Systems	U.S./ Canada
2. Software Tools for the Development of Software for Safety Systems – NEA public website	U.K.
3. Verification and Validation throughout the life cycle of safety systems using digital computers	Japan
4. Complex Electronics	France
5. Data Communication Independence – NEA public website	Korea
6. Simplicity in Design – NEA public website	U.S.
7. Qualification of Industrial Digital Devices of Limited Functionality for Use in Safety Applications	IAEA

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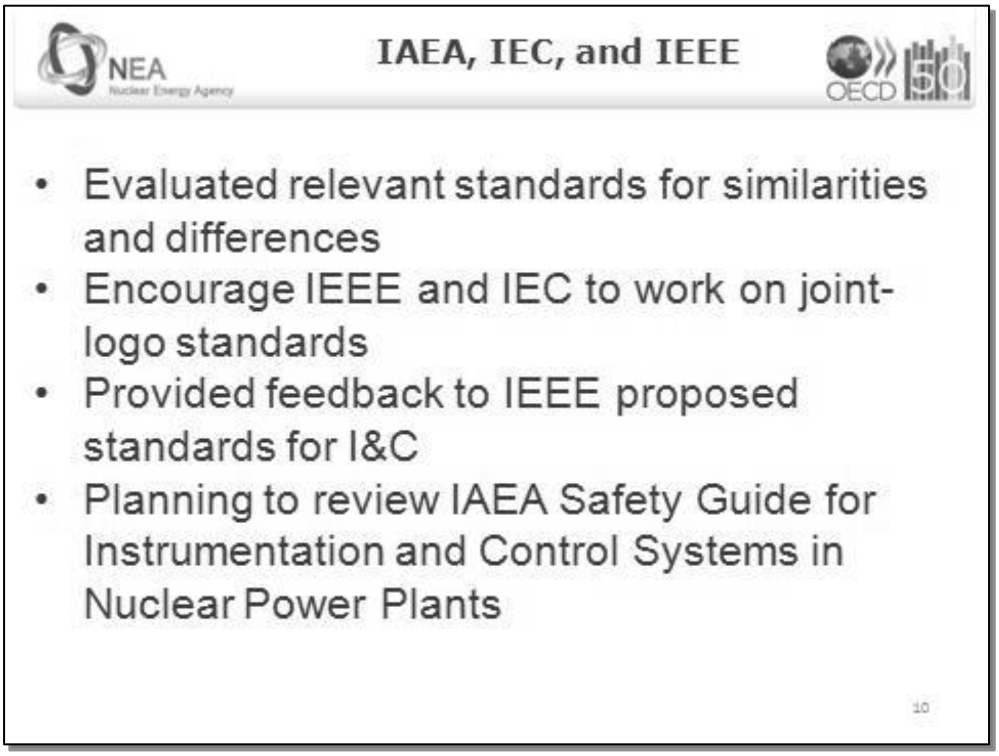
DICWG Common Positions

OECD 50

Generic Common Positions	Lead
8. Safety Issues Related to Interactions Between Safety and Security	U.S.
9. System Architectural Considerations for Systems Classified at the Highest Safety Level – early stages	IAEA
10. Configuration Management for Software – early stages	Finland
11. Factory and Site Acceptance Testing – early stages	Russian Federation
12. Coping with CCF – early stages	France / U.K.
13. Surveillance Testing – early stages	Korea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IAEA, IEC, and IEEE
OECD
• Evaluated relevant standards for similarities and differences
• Encourage IEEE and IEC to work on joint-logo standards
• Provided feedback to IEEE proposed standards for I&C
• Planning to review IAEA Safety Guide for Instrumentation and Control Systems in Nuclear Power Plants
10


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Challenges
OECD
• Agreement on common terminology
• Differences in regulatory practices, standards, regulations, reactor designs, and experience
• Differences in classification schemes and overall safety approach
11

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Path Forward

OECD 50

- Continued timely sharing of information and cooperation among members including frequent interactions with design-specific DICWG, other MDEP working groups, and STC.
- Continued development of generic common positions
- Identify research needs for areas where working group concludes that the current level of technical knowledge is insufficient to support establishment of a common position
- Continued coordination of convergence and harmonization of standards

12

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QUESTIONS/CONTACTS

OECD 50

MDEP DICWG Chair – Daniel Santos, Daniel.Santos@nrc.gov

NEA technical secretariat – Byung-soon Kim byung-soon.kim@oecd.org

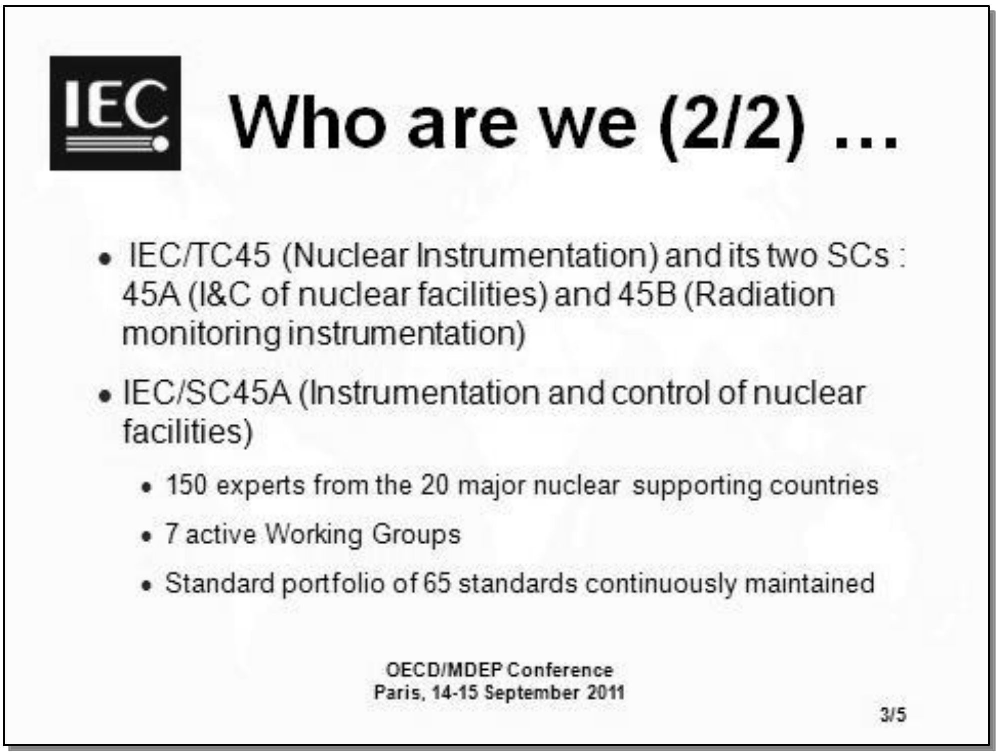
MDEP url for generic common positions, http://www.oecd-nea.org/mdep/common-positions/dic.html

13

IEC SC45A

Jean-Paul Bouard, IEC SC45A Secretary, IEC


IEC
Who are we (1/2) …
One of the oldest international standard body (1906) : 81 countries members, In the world: 80% population,95% electrical energy, 50% trade
Electrotechnology domain covered by 175 Technical Committees and Sub-Committees
IEC at International level
ISO/ITU/IEC sister organizations
WTO, TBT agreement recognisingISO/IEC standards
IEC/IAEA collaboration agreement
IEC/CENELEC collaboration agreement
IEC/IEEE collaboration agreement
Collaboration with OECD (MDEP project)
OECD/MDEP Conference
Paris, 14-15 September 2011
2/5


IEC
Who are we (2/2) …
IEC/TC45 (Nuclear Instrumentation) and its two SCs : 45A (I&C of nuclear facilities) and 45B (Radiation monitoring instrumentation)
IEC/SC45A (Instrumentation and control of nuclear facilities)
150 experts from the 20 major nuclear supporting countries
7 active Working Groups
Standard portfolio of 65 standards continuously maintained
OECD/MDEP Conference
Paris, 14-15 September 2011
3/5

How do we work …

- Transparent, traceable, consensus based
  - 3 stages of approval and 4 stages for comment
- All the actors represented in the technical debate (SAs, operators, vendors)
- National Committees vote and comment
- 4 years in average to develop a standard
- For more information on those general aspects go to http:\www.iec.ch

OECD/MDEP Conference
Paris, 14-15 September 2011

4/5

Many successful collaborations going on with objectives of requirements harmonization …

- IEC/SC45A implement technically IAEA safety principles for I&C in detail in industrial standards using IAEA safety glossary
- 12 IEC/SC45A standards are already endorsed without modification in Europe and published as national standards in 31 European countries
- 8 IEC/IEEE standards are currently developed in collaboration with IEEE/NPEC
- Invitation of the IEC/SC45A to the OECD/MDEP/DICWG meetings, integration of 13 IEC/SC45A standards in the MDEP library for consideration

OECD/MDEP Conference
Paris, 14-15 September 2011

5/5

Doosan Heavy Industries and Construction

Kook Hun Kim, Vice-President, Doosan Heavy Industries and Construction

Contents

Korea's NPP status & Korea Map

☐ Korea's NPP status (July 2011)

– 21 units operating
– 7 units under construction
– 8 units planned

Oversea

–UAE # 1,2,3,4

–Yonggwang Nuclear Power Site # 1, 2, 3, 4, 5, 6

–Ulchin Nuclear Power Site # 1, 2, 3, 4, 5, 6
–Shin-Ulchin # 1, 2
–Shin-Ulchin # 3, 4

–Wolsong Nuclear Power Site # 1, 2, 3, 4, 5, 6
–Shin-Wolsong # 1, 2

–Kori Nuclear Power Site # 1, 2, 3, 4
–Shin-Kori # 1
–Shin-Kori # 2, 3, 4
–Shin-Kori # 5,6

–NPP in Operation
–NPP under Construction
–NPP Planed

DOOSAN's Facility

☐ **INTEGRAGED MANUFACTURING COMPLEX**

DOO SAN has an integrated manufacturing facility which is capable of from raw material production to final assembly of components for Power Plants in Changwon, Korea.

Doosan Heavy Industries & Construction 3

Doosan Digital I&C Experience

☐ **National R&D Project : KNICS(2001.7 ~ 2008.4)**

☐ **KINS SER**

- Acquisition of Safety Evaluation Report from KINS(Korea Institute of Nuclear Safety)
  - Plant Protection System, Engineered Safety Features-Component Control System, Reactor Core Protection System, Class-1E Programmable Logic Controller('09/2/18)

☐ **IAEA Review**

- Objective
  - Improve the acceptance and reliability of the DOOSAN I&C system.
  - Assist in developing a firm design basis for projects in the domestic and international markets

☐ **Strength of Doosan I&C**

- Pre-installation validation using integrated performance and validation test facility
- Third party review and KINS safety evaluation during R&D phase.
- Application of PLDs a development process that is similar to the software development process.
- Application of TTL logic downstream of the main priority logic(diversity policy)
- Fault tolerance structure of PPS(2 bistable processor and 3 coincidence processor per each channel) & ESF-CCS(2 out of 3 structure)
- Design of the control rod control system eliminating single point vulnerability.

Doosan Heavy Industries & Construction 4

Doosan Digital I&C Experience

☐ Shin-Ulchin #1, 2 under manufacturing

☐ Control Rod System(CRCS/CEDM-CS)
- Contracted 12 units.
- 4 units supplied.
- Main Features
  - Eliminate SPVs
    1)Double & DC Holder : Never drop the CEAs except RPCS or PPS
    2)Full redundant Design : Any single failure will not affect the normal operation
  - Enhance the Operability & Maintainability
    1) MTP MMI : Easily Find the Root Cause
    2) Drawer type PCM

☐ ASTS(Automatic seismic trip system)
- Contracted 20 units(Kori 4 units, Yonggwang 6 units, Wolsong 4 units, Ulchin 6 units)
- 4 units supplied.

Doosan Heavy Industries & Construction 5

Suggestions(based on Doosan experience)

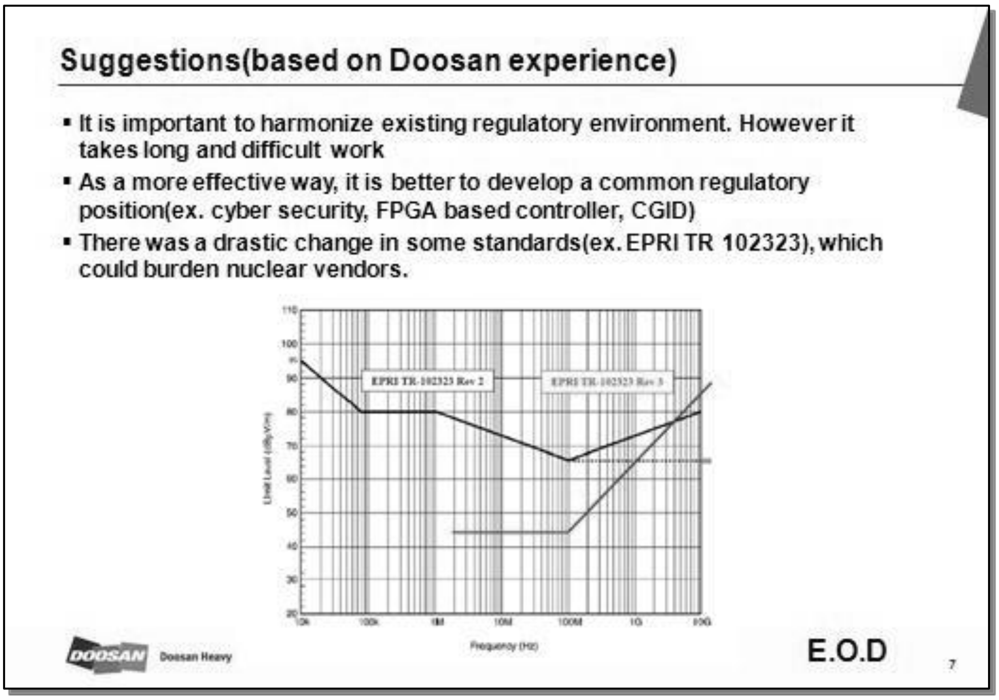
- From 2008 to 2010, AREVA, Westinghouse & EDF suggested and commented issues in the view point of supplier/vendor/system designer


System designer is different from each other


slow start, long stride & high propulsion, finish spurt or quick start, early propulsion & manages the race

- Safety(best performance) could be changed according to design and operation principle

Doosan Heavy Industries & Construction 6


Suggestions(based on Doosan experience)
▪ It is important to harmonize existing regulatory environment. However it takes long and difficult work
▪ As a more effective way, it is better to develop a common regulatory position(ex. cyber security, FPGA based controller, CGID)
▪ There was a drastic change in some standards(ex. EPRI TR 102323), which could burden nuclear vendors.
EPRI TR-102323 Rev 2
EPRI TR-102323 Rev 3
110
100
90
80
70
60
50
40
30
20
10k
100k
1M
10M
100M
1G
10G
Frequency (Hz)
DOOSAN
Doosan Heavy
E.O.D
7

SESSION 4

MDEP ACTIVITIES AND ACCOMPLISHMENTS OF THE MECHANICAL CODES AND STANDARDS WORKING GROUP (CSWG)

SESSION 4 SUMMARY

Mr. Peter Bester, South African Policy Group representative chaired this session. The following persons made remarks and/or gave presentations on the status of the issue-specific working groups on mechanical Codes and Standards Working Group (CSWG):

- Xuejun Wei, Canadian Nuclear Safety Commission (CNSC), Chair of the CSWG, gave a presentation on the work of the CSWG;
- Dr. Kiyoharu Abe, Japan Nuclear Energy Safety Organisation (JNES), Japan STC member;
- Bo Tang, National Nuclear Safety Administration (NNSA), China PG and STC member, gave a presentation on the use of codes and standards in China;
- Rick Swayne, vice president of the American Society of Mechanical Engineers (ASME), gave a presentation on the SDOs code comparison project;
- Masaki Morishita, deputy director general of Japan Atomic Energy Agency (JAEA), Japan Society of Mechanical Engineers representative (JSME), gave a presentation on JSME perspective on the code comparison project;
- Cécile Laugier, president of the French Association for the rules governing the Design, Construction and Operating Supervision of the Equipment Items for Electro Nuclear Boilers (AFCEN), gave a presentation on the code comparison perspectives;
- Nawal Prinja, technical director of AMEC/Hindustan Construction Company (HCC), WNA/CORDEL representative, gave a presentation of WNA and the code comparison project from the CORDEL point of view.

The presentation given regarding the CSWG status outlined the ultimate goal of the working group to achieve harmonisation of code requirements for design and construction of pressure-retaining components. Steps to be taken are at first the establishment of fundamental attributes, then their development into essential safety references (since renamed to essential performance guidelines of pressure boundary components) and finally the convergence of the code and standards, with the major involvement of the standard development organisations. The CSWG already drafted the fundamental attributes and essential elements and the essential safety references documents. A great benefit of the MDEP CSWG work was bringing together the SDOs who conducted a comparison of each country’s code with the ASME code, thus setting strong basis to further move toward harmonisation of codes. The presentation highlighted the effort of the CSWG for preventing further divergence of the codes and for reconciling current codes and regulatory practices.

The representative of NNSA presented how mechanical codes and standards are used in licensing Chinese power plants. At first, nuclear power plants and their components were built according to foreign codes in force in the countries of vendors and to codes related to non nuclear facilities. Presently, French

RCC-M code is used for the construction of CPR1000 NPPs, which are derived from French NPPs, and for EPR NPPs, and ASME is used for the construction of AP1000 NPPs. Concern is given to the use of several codes in the same power plant, e.g. when RCC-M is followed for the construction and ASME for the manufacturing of components, notably when there are interfaces between the two. Another example is when a component is manufactured according to RCC-M and must be inspected following ASME. Furthermore, China will develop its own codes and standards.

The presentation on the SDOs project on the comparison of codes from ASME, AFCEN, JSME, KEA, CSA and NIKIET, initiated by the VICWG, first highlighted the goal of identifying the differences between the codes for manufacturing class 1 components. The final report is planned to be available in early 2012. Secondly the comparison identified the major differences between ASME and others codes, such as the scope of application of the codes, the quality assurance requirements (ASME NQA-1, ISO and IAEA for RCC-M), and the specification of Canadian code for the specific types of reactors. The representative from JSME narrowed the comparison to the conclusions regarding JSME versus ASME. Differences are mainly that some ASME topics are not addressed in JSME and there are different references for quality assurance. The presentation concluded that next steps, harmonisation of existing codes and preclusion of further divergence, need the continuation of regular meetings and discussions between SDOs, the CSWG and WNA CORDEL.

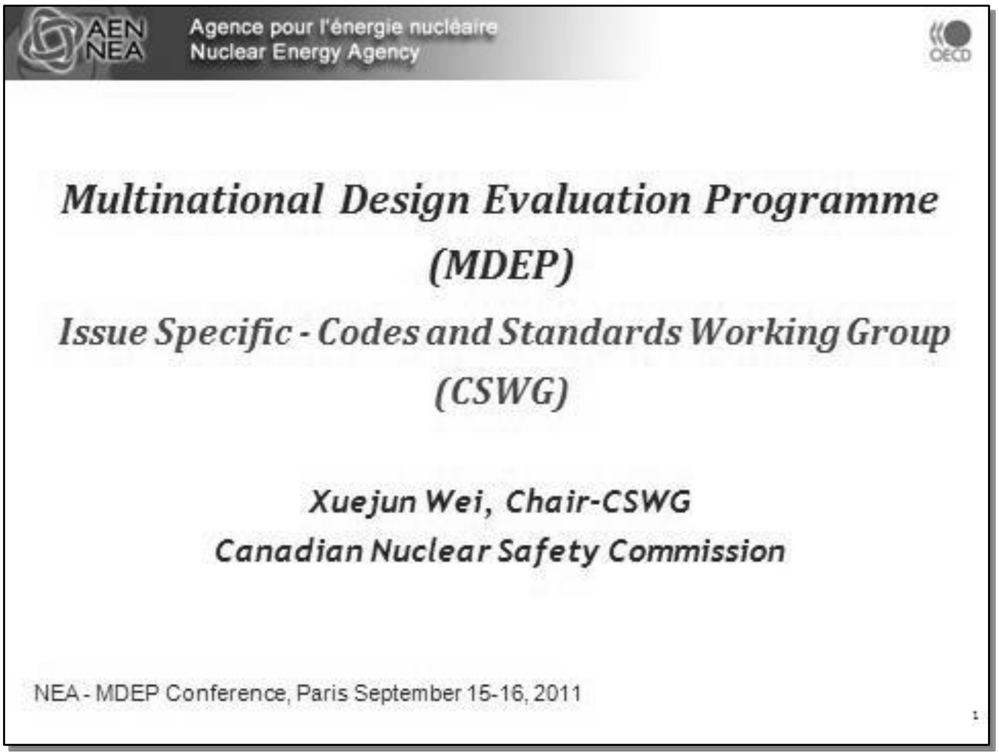
The AFCEN representative also emphasised the fact that harmonisation would be beneficial for allowing compatibility in practices and acceptance of components worldwide. As some codes are updated with regulator inspection results and utilities involvement, cultural and legal differences were found to be dominants. Therefore, safety authorities will have to play a significant role in allowing mutual recognition of different codes and standards.

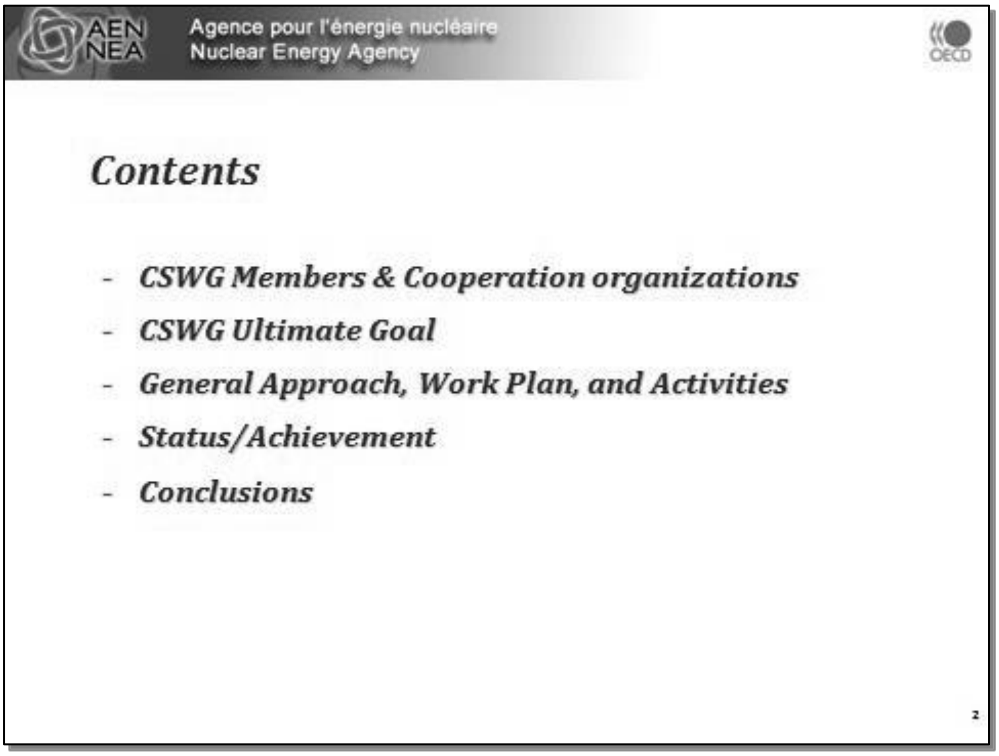
The WNA CORDEL representative presented the World Nuclear Association organisation and underlined the economic advantages and additional safety layers that would follow from harmonisation of international requirements and standards. Through its 2011 programme plan, CORDEL supported MDEP and the SDOs effort toward their goal. After examination of code comparison to date, CORDEL proposed to set up a pilot project focused on codes and standards related to technical design, such as stress allowable and analysis methods, and personnel qualifications.

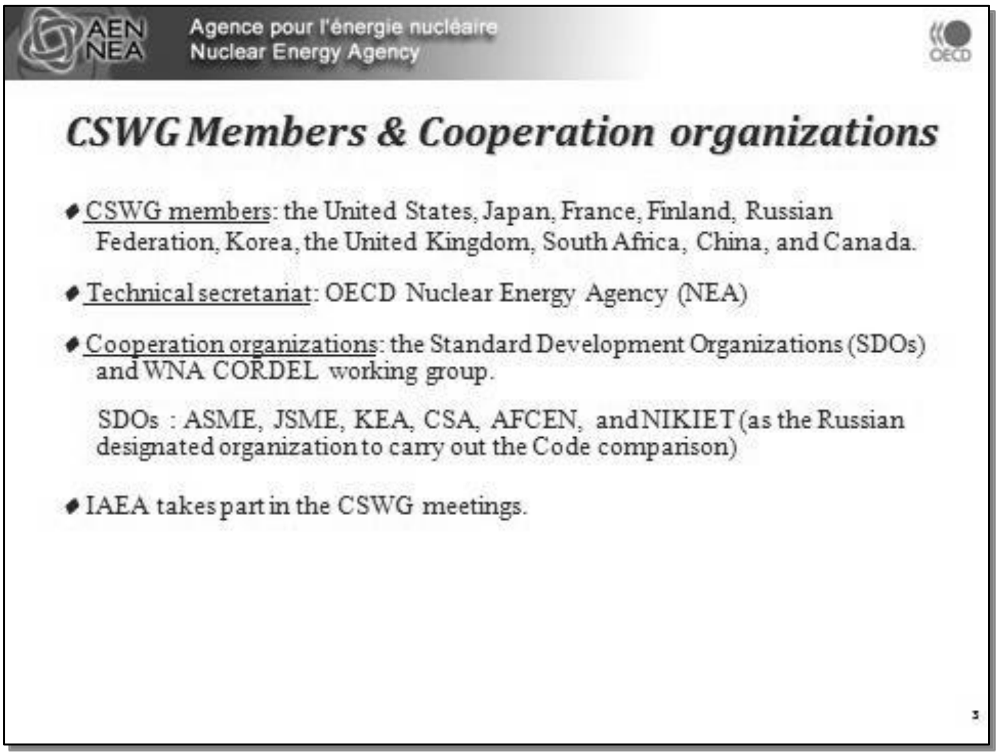
MDEP representatives congratulated the SDOs on the codes comparison work and urged timely publication of the report and associated comparison tables. The MDEP representatives also encouraged close communication between the SDOs, WNA CORDEL, and the CSWG regarding the steps being taken for harmonisation and to limit significant future code divergences.

Codes and Standards Working Group

Xuejun Wei, Chair of the CSWG, CNSC




AEN NEA
Agence pour l'énergie nucléaire
Nuclear Energy Agency
OECD
Contents
- CSWG Members & Cooperation organizations
- CSWG Ultimate Goal
- General Approach, Work Plan, and Activities
- Status/Achievement
- Conclusions
2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CSWG Members & Cooperation organizations
CSWG members: the United States, Japan, France, Finland, Russian Federation, Korea, the United Kingdom, South Africa, China, and Canada.
Technical secretariat: OECD Nuclear Energy Agency (NEA)
Cooperation organizations: the Standard Development Organizations (SDOs) and WNA CORDEL working group.
SDOs : ASME, JSME, KEA, CSA, AFCEN, and NIKIET (as the Russian designated organization to carry out the Code comparison)
IAEA takes part in the CSWG meetings.
3

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CSWG Ultimate Goal

- CSWG ultimate goal is harmonization of code requirements for design and construction of pressure-retaining components.

- CSWG preliminary definitions:

Harmonization: Establishing a framework for convergence and for reconciliation of differences in code requirements.

Convergence: Increasing the areas identified as same or equivalent while reducing the areas of difference.

Reconciliation: Developing MDEP positions for mutual recognition of differences.

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General Approach

- General Guidance and Common Code Aspects – *Current Focus*

  Referenced as an international basis in:
  1) Studying the possibility of using a foreign code;
  2) Preventing further code divergence;
  3) Developing/maintaining technical regulatory guidelines in each country.

- Harmonization of Code Requirements – *Current Focus*
  1) Convergence is limited to technical differences. Convergence of administrative differences is very difficult as they have cultural, historical, industrial and legal backgrounds in each country.
  2) Administrative differences could be harmonized through reconciliation.

- Application of code to components – *In Consideration*
  1) Regulatory practice in using code
  2) Code classification of components

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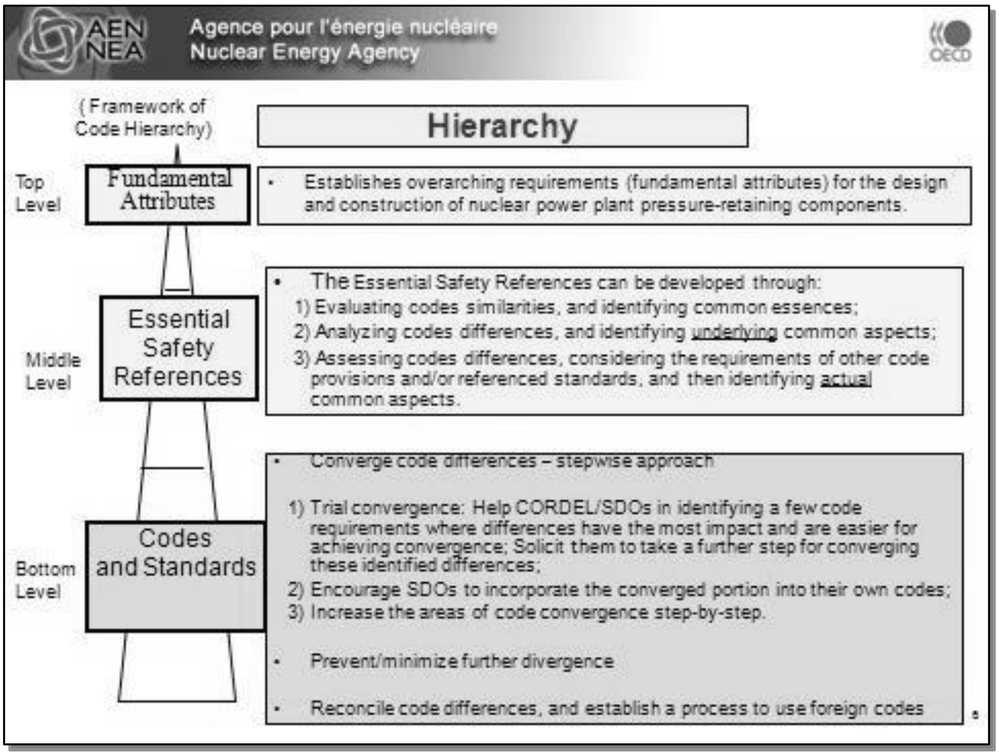

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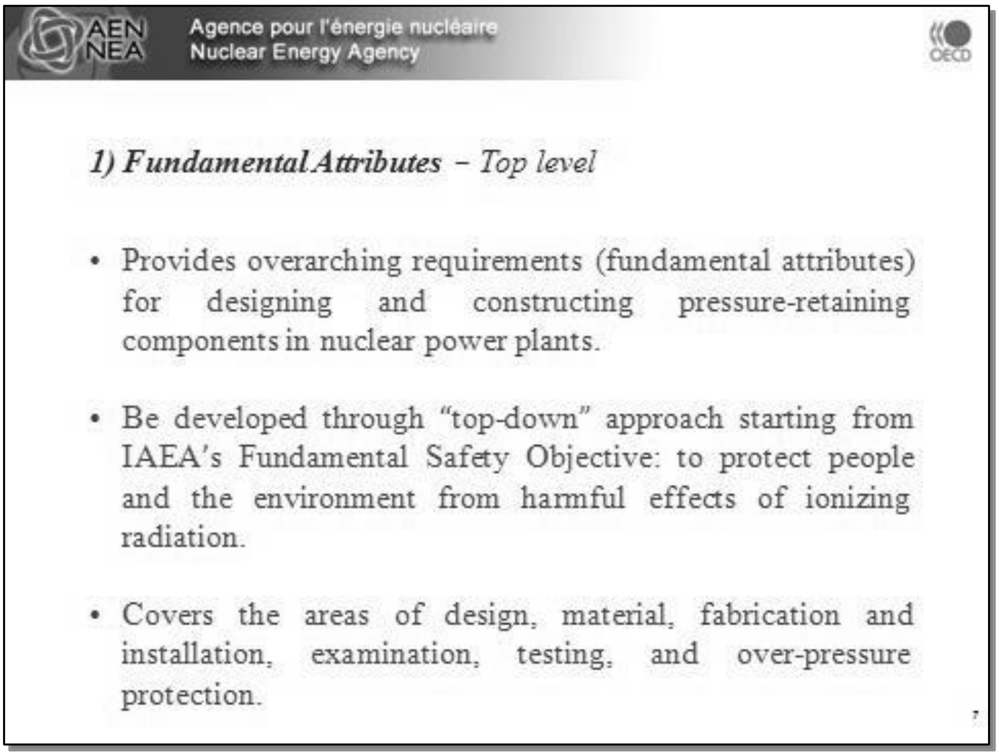
(Framework of Code Hierarchy)
Hierarchy
Top Level
Fundamental Attributes
• Establishes overarching requirements (fundamental attributes) for the design and construction of nuclear power plant pressure-retaining components.
Middle Level
Essential Safety References
• The Essential Safety References can be developed through:
1) Evaluating codes similarities, and identifying common essences;
2) Analyzing codes differences, and identifying underlying common aspects;
3) Assessing codes differences, considering the requirements of other code provisions and/or referenced standards, and then identifying actual common aspects.
Bottom Level
Codes and Standards
• Converge code differences – stepwise approach
1) Trial convergence: Help CORDEL/SDOs in identifying a few code requirements where differences have the most impact and are easier for achieving convergence; Solicit them to take a further step for converging these identified differences;
2) Encourage SDOs to incorporate the converged portion into their own codes;
3) Increase the areas of code convergence step-by-step.
• Prevent/minimize further divergence
• Reconcile code differences, and establish a process to use foreign codes



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1) Fundamental Attributes – Top level
• Provides overarching requirements (fundamental attributes) for designing and constructing pressure-retaining components in nuclear power plants.
• Be developed through "top-down" approach starting from IAEA's Fundamental Safety Objective: to protect people and the environment from harmful effects of ionizing radiation.
• Covers the areas of design, material, fabrication and installation, examination, testing, and over-pressure protection.
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2) Essential Safety References – Middle level

- Establish mid-level guidance to identify the common code aspects.
- Be developed through "bottom-up" approach based on the evaluation and analysis of code similarities and differences:

  1) Evaluating code similarities, and identifying common essences;
  2) Assessing code differences, considering the requirements of other code provisions and/or referenced standards, and then identifying **actual** common aspects;
  3) Analyzing code differences, and identifying **underlying** common aspects.

- All codes comply with the Essential Safety References if fully implemented or supplemented with referenced industry standards.

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3) Convergence of code difference – Bottom level

- Stepwise approach – for existing code:
  1) Trial convergence: Help CORDEL/SDOs in identifying a few code requirements where differences have the most impact and are easier for achieving convergence; Solicit them to take a further step for converging these differences. If succeed, then
  2) Encourage SDOs to incorporate the converged portion into their own codes
  3) Increase the areas of code convergence step-by-step

- CORDEL "Pilot Project" is coincidently similar to the 1st step of CSWG Convergence approach, the "Trial Convergence".

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4) Prevent further divergence – Bottom level

- For revision of existing code
  Code is a comprehensive, living document that is continually being updated to incorporate the improved understanding and the accumulated operational experience. CSWG encourages SDOs to communicates with each other and develop a strategy to minimize the code differences during code revision.

- For development of new code
  Some countries are considering to develop their own codes. CSWG encourages these countries to study the existing codes carefully and minimize the potential differences between new codes and the existing codes.

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Nuclear Energy Agency

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5) Reconciliation of Code Differences – Bottom level

Reconciliation of code differences will be performed through the following approaches:

- Technical differences: reconciled by demonstrating that 1) The different requirements provide an equivalent level of quality and safety; or 2) A comparatively looser provision in one code is compensated by other more stringent provision(s) of the code, and the full implementation of the code still results in an equivalent quality and safety.

- Differences not addressed in one Code: reconciled by showing how the requirement is addressed elsewhere or justifying why it is not necessary.

- Administrative differences: reconciled by establishing MDEP positions for identifying which codes and/or rules are applicable under various scenarios.

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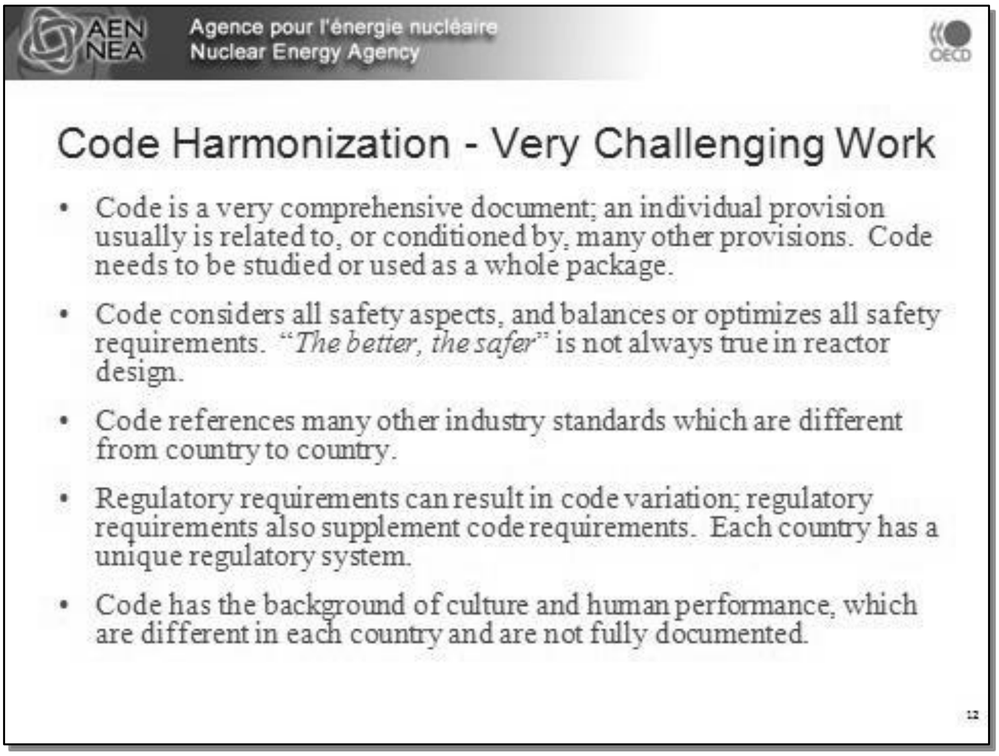
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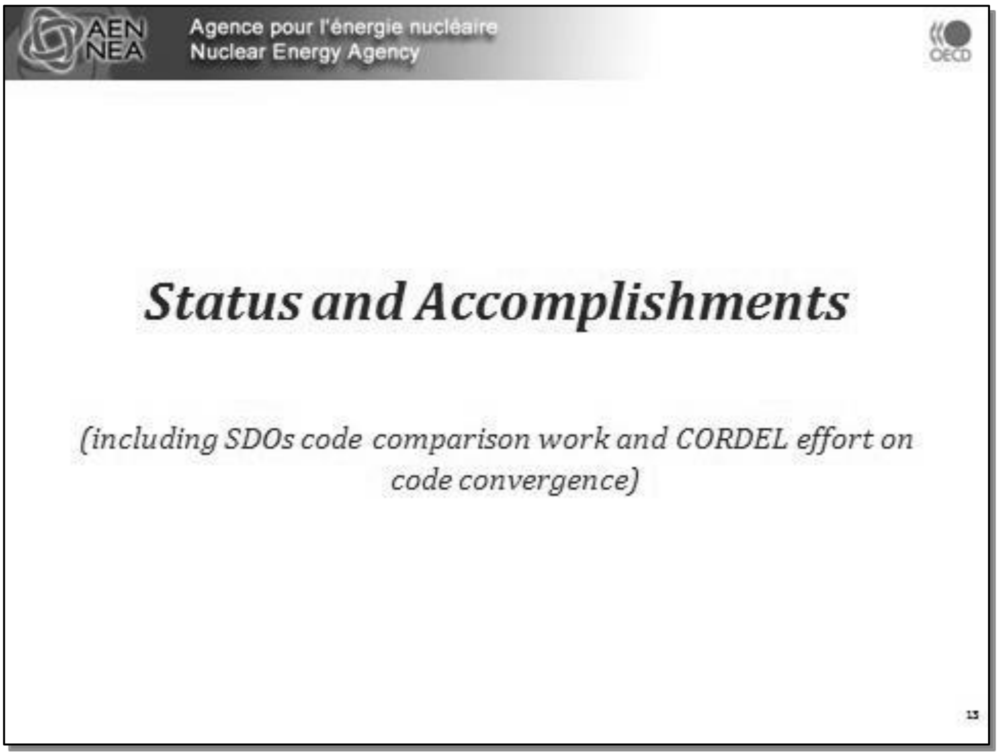
Code Harmonization - Very Challenging Work
• Code is a very comprehensive document; an individual provision usually is related to, or conditioned by, many other provisions. Code needs to be studied or used as a whole package.
• Code considers all safety aspects, and balances or optimizes all safety requirements. "The better, the safer" is not always true in reactor design.
• Code references many other industry standards which are different from country to country.
• Regulatory requirements can result in code variation; regulatory requirements also supplement code requirements. Each country has a unique regulatory system.
• Code has the background of culture and human performance, which are different in each country and are not fully documented.
12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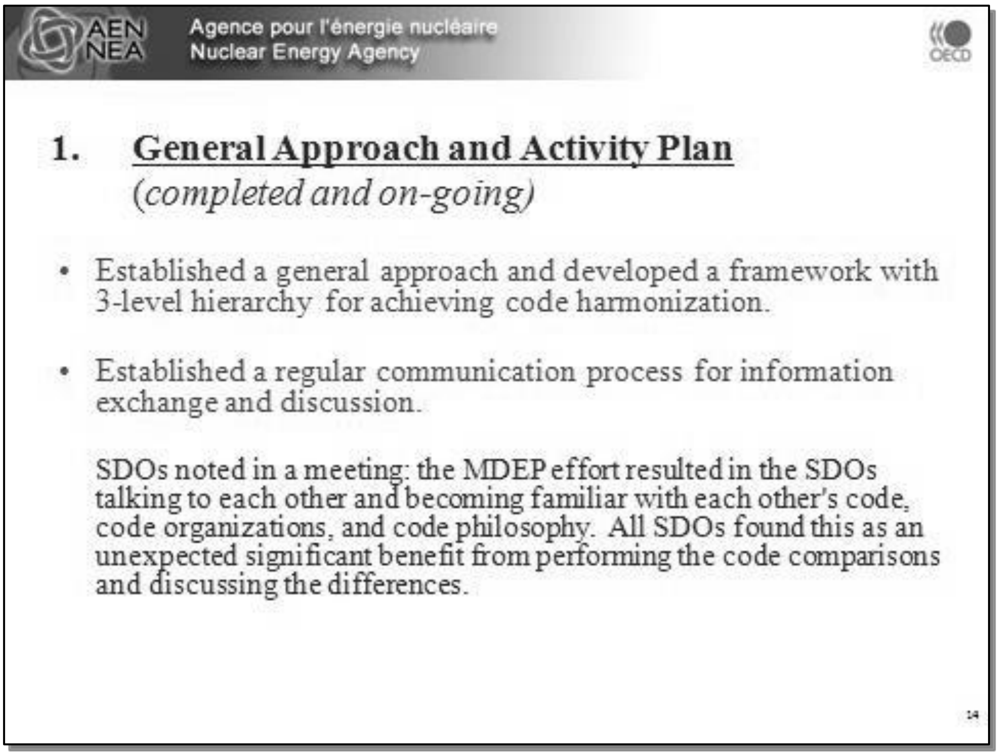
Status and Accomplishments
(including SDOs code comparison work and CORDEL effort on code convergence)
13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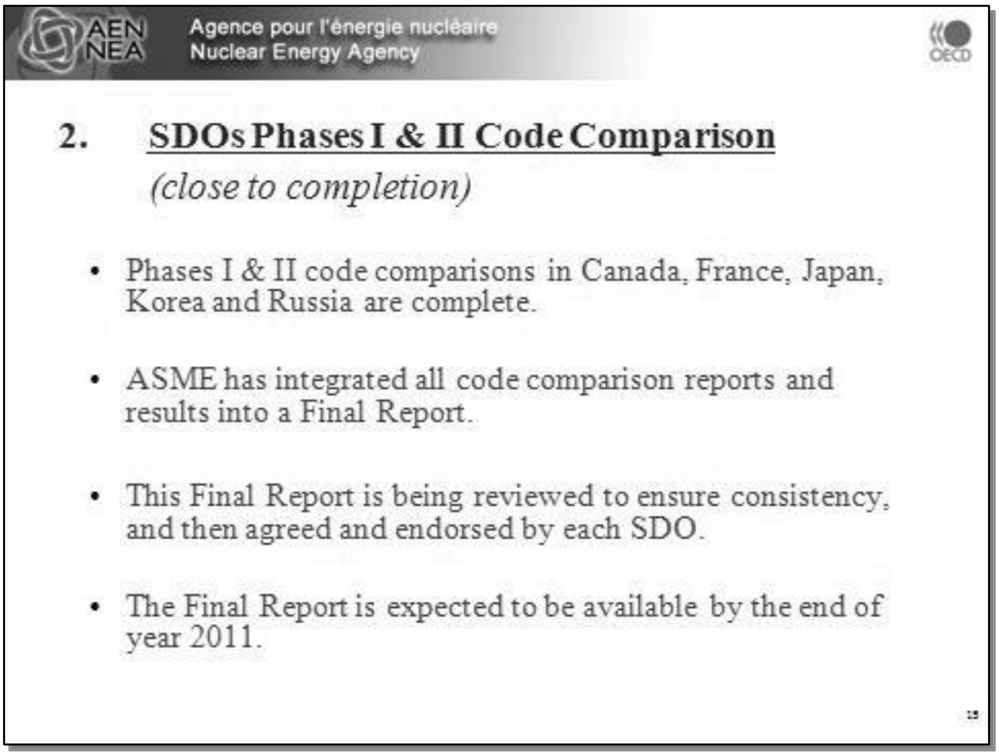
1. General Approach and Activity Plan
(completed and on-going)
• Established a general approach and developed a framework with 3-level hierarchy for achieving code harmonization.
• Established a regular communication process for information exchange and discussion.
SDOs noted in a meeting: the MDEP effort resulted in the SDOs talking to each other and becoming familiar with each other's code, code organizations, and code philosophy. All SDOs found this as an unexpected significant benefit from performing the code comparisons and discussing the differences.
14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OECD
2. SDOs Phases I & II Code Comparison
(close to completion)
• Phases I & II code comparisons in Canada, France, Japan, Korea and Russia are complete.
• ASME has integrated all code comparison reports and results into a Final Report.
• This Final Report is being reviewed to ensure consistency, and then agreed and endorsed by each SDO.
• The Final Report is expected to be available by the end of year 2011.
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Significance of Code Comparison

- Identifies the extent of similarities and differences between each country's code to the ASME Code;
- Gives CSWG an insight into the background, history, and philosophy of each code;
- Provides a basis for CSWG to develop a general approach and a framework for achieving code harmonization;
- Represents the first step of many toward CSWG ultimate goal.

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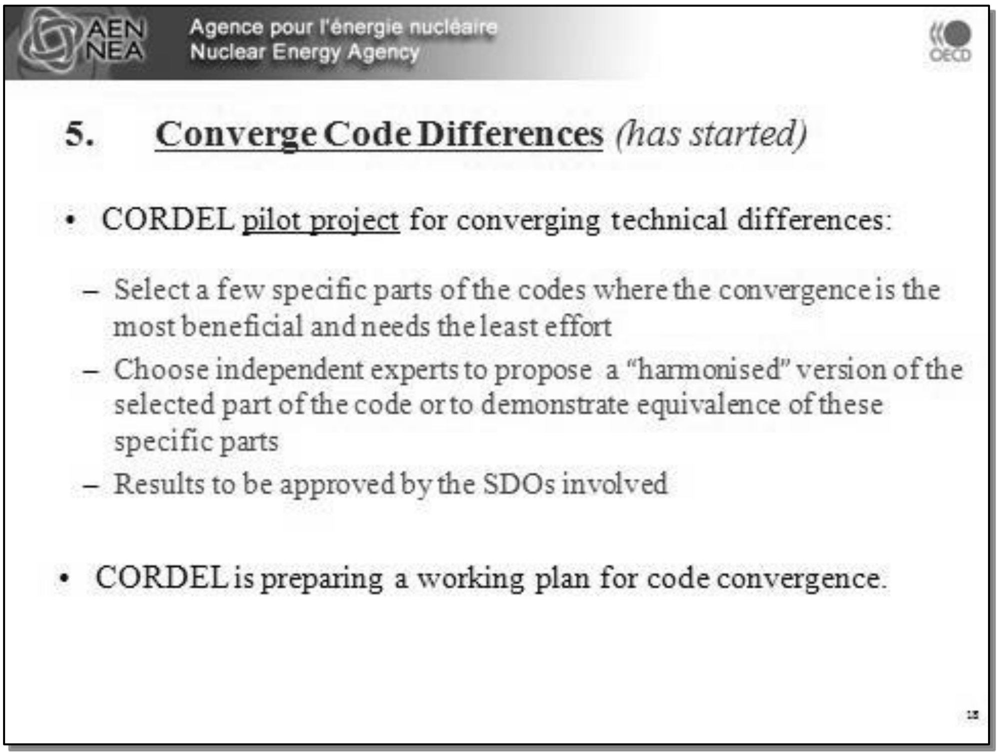
3. Fundamental Attributes and Essential Elements *(first draft developed)*

- See top level of hierarchy
- Will seek SDOs comments

4. Essential Safety References *(first draft developed)*

- See middle level of hierarchy
- Will seek SDOs comments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5. Converge Code Differences (has started)
• CORDEL pilot project for converging technical differences:
– Select a few specific parts of the codes where the convergence is the most beneficial and needs the least effort
– Choose independent experts to propose a "harmonised" version of the selected part of the code or to demonstrate equivalence of these specific parts
– Results to be approved by the SDOs involved
• CORDEL is preparing a working plan for code convergence.
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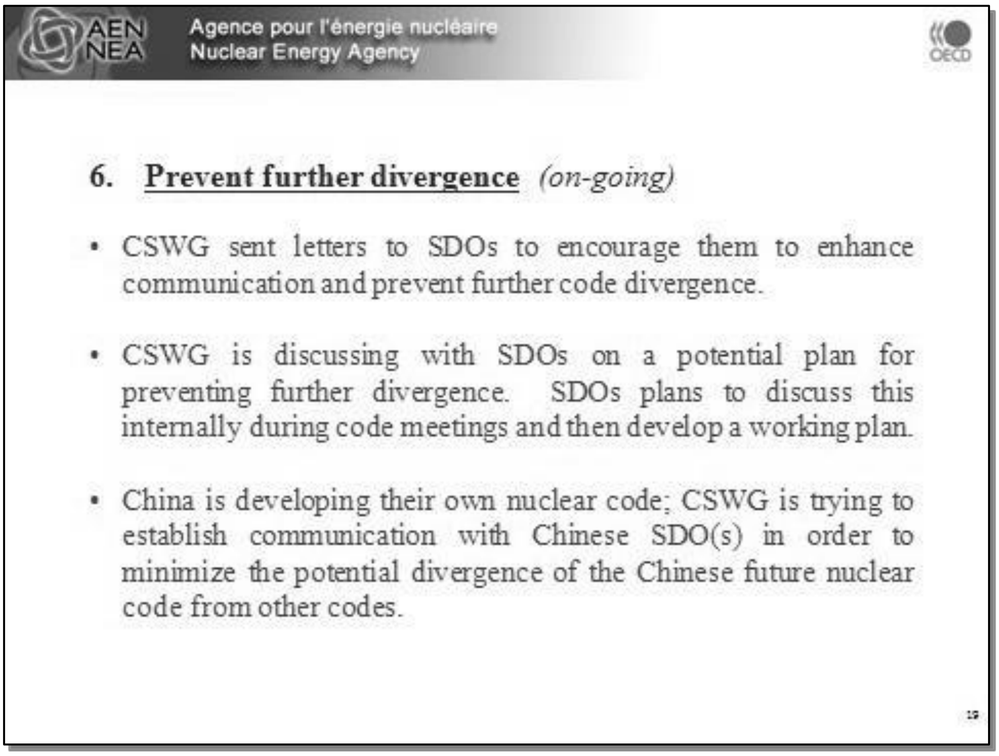
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OECD
6. Prevent further divergence (on-going)
• CSWG sent letters to SDOs to encourage them to enhance communication and prevent further code divergence.
• CSWG is discussing with SDOs on a potential plan for preventing further divergence. SDOs plans to discuss this internally during code meetings and then develop a working plan.
• China is developing their own nuclear code; CSWG is trying to establish communication with Chinese SDO(s) in order to minimize the potential divergence of the Chinese future nuclear code from other codes.
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Agence pour l'énergie nucléaire
Nuclear Energy Agency

7. **Reconciliation of Code Differences** *(on-going)*

- Study and assess code comparison results and reconcile some technical differences
- Invite experienced specialists to give presentations on how their countries use foreign codes
  - Finnish representative gave a presentation on how STUK uses foreign codes for stress analysis.
  - More presentations will be arranged in the future meetings with the purpose of obtaining some ideas on how the goal of reconciliation can be achieved.

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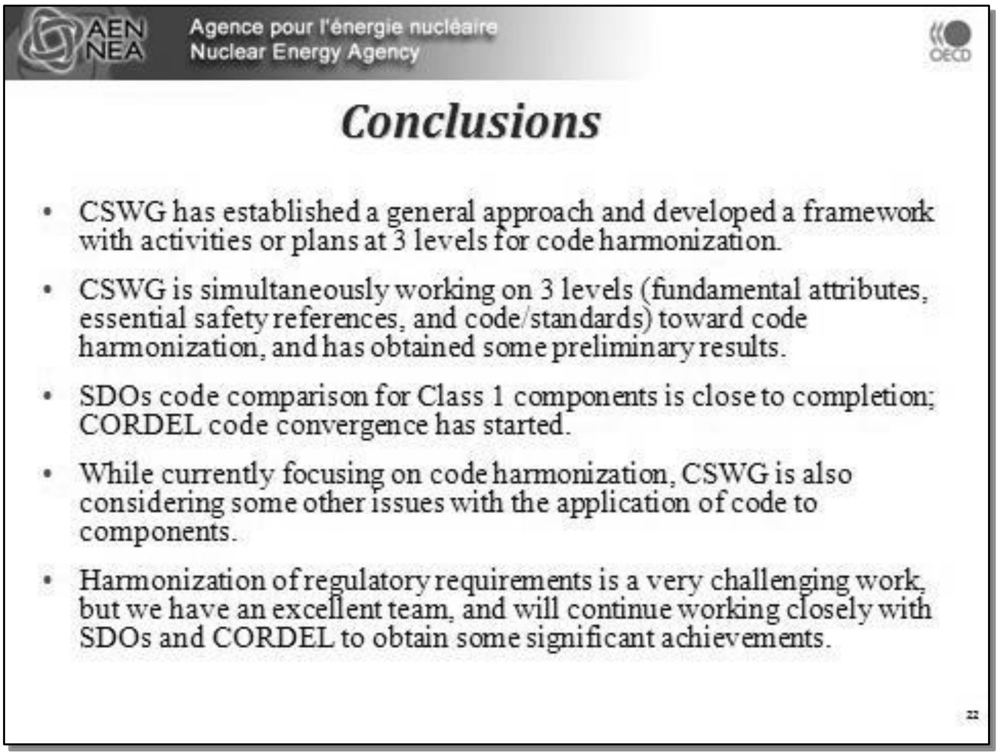
Nuclear Energy Agency

8. **Safety Classification of Components** *(completed and on-going)*

   A summary, on how safety classification is affecting application of code, has been provided to the STC

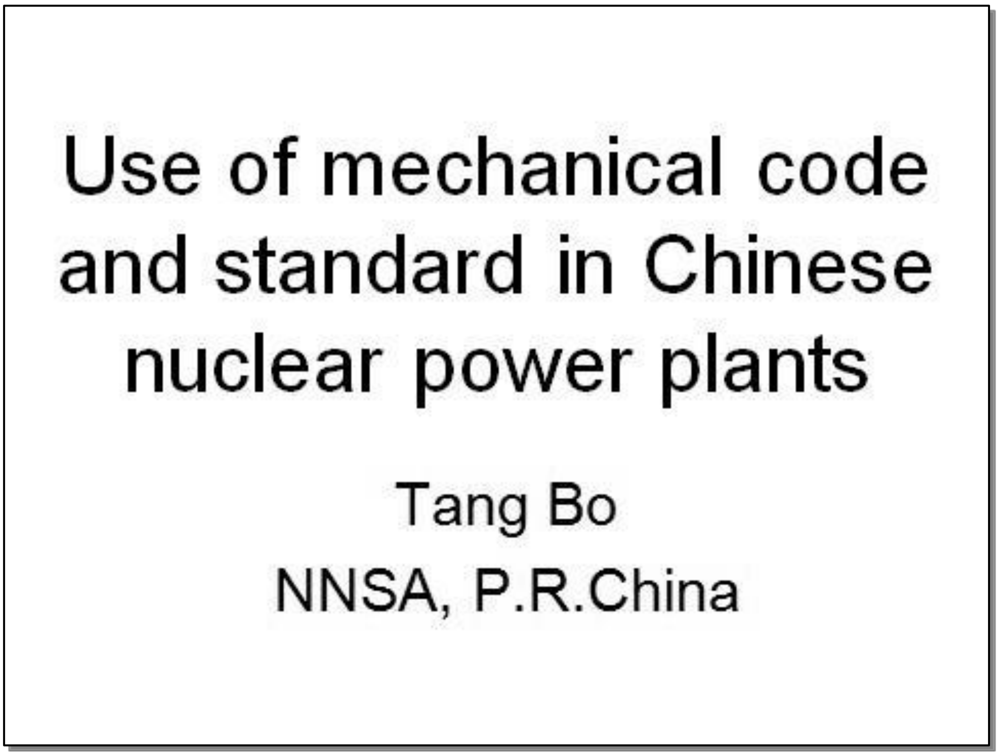
9. **MDEP document to describe the regulatory practices in using codes** *(close to completion)*

21


AEN
NEA
Agence pour l'énergie nucléaire
Nuclear Energy Agency
OECD
Conclusions
• CSWG has established a general approach and developed a framework with activities or plans at 3 levels for code harmonization.
• CSWG is simultaneously working on 3 levels (fundamental attributes, essential safety references, and code/standards) toward code harmonization, and has obtained some preliminary results.
• SDOs code comparison for Class 1 components is close to completion; CORDEL code convergence has started.
• While currently focusing on code harmonization, CSWG is also considering some other issues with the application of code to components.
• Harmonization of regulatory requirements is a very challenging work, but we have an excellent team, and will continue working closely with SDOs and CORDEL to obtain some significant achievements.
22

Japan National Nuclear Safety Agency (NNSA)

Bo Tang, Member of the PG, Deputy Director General, NNSA



1.Status of mechanical code and standard used in Chinese NPPs

(1)Qinshan Nuclear power plant:

GB150 that is for chemical industry and fossil power plant was used due to no Chinese code or standard for safety-classified component in China at that time.

Some equipments, for example, reactor coolant pump that was from Germany, used German code. Reactor pressure vessel that was from Japan, used ASME code.

ASME Code was used for reevaluation and check after NNSA was established.

(2)Qinshan phase II Nuclear power plant

French RCC-M is used for Qinshan phase II nuclear power plant.

Some equipments, for example, steam generator, that was from Spain, and reactor coolant pump that was from Japan, use ASME code.

(3)Qinshan phase III Nuclear power plant:

CANDU type reactor, ASME code is used for Qinshan phase III nuclear power plant.

(4)Tianwan nuclear power plant:

Russian standard, known as Gost, is used for Tianwan nuclear power plant.

(5)Daya Bay, LingAo phase I and LingAo phase II Nuclear power plant:

RCC-M is used for Daya Bay, LingAo phase I and LingAo phase II nuclear power plant.

(6)CPR-1000 nuclear power plant:

CPR-1000 is designed refer to Daya Bay and LingAo nuclear power plants, is now under large scale construction (about 20 units) in China. Basically CPR-1000 use French RCC-M code.

Because likely global purchasing, other mechanical code or standard is possibly used in some CPR-1000 nuclear power plants.

(7)AP-1000 nuclear power plant:

Now 4 AP-1000 units are under construction in Sanmen and Haiyang site of China, ASME is used for them.

(8)EPR nuclear power plant:

Now 2 EPR units are under construction in Taishan site of China, RCC-M is used for them.

2. Treatment of some issues due to different code and standard used in one nuclear power plant:

Due to design, purchasing, repair, replacement, etc, different code or standard may be used in one plant or system, so that some special issues must be treated carefully.

(1)Welding:

As described above, there is the situation of different code used in one plant or system in China. For example, reactor coolant system basically follow RCC-M, but reactor coolant pump and steam generator follow ASME in Qinshan phase II NPP.

Welding procedure for interface part must be qualified carefully and completely.

Code or standard of welding should be identified so that it is consistent with code or standard that pre-service inspection and in-service inspection will follow.

(2)Pre-service and in-service test:

There may be some different requirements in different code or standard. For example, RCC-M is developed based ASME, but hydraulic test pressure of reactor coolant system for pre-service and in-service is 1.33 design pressure and 1.2 design pressure separately according to RSEM.

Correspondingly, hydraulic test pressure of reactor coolant system for pre-service and in-service is 1.25 design pressure and 1.1 operating pressure separately according to ASME.

Resolution is, first, identifying the code or standard followed by system. Second, identifying

test requirements for pre-service and in-service test according to the code or standard. Then, performing evaluation, such as stress analysis, fatigue assessment, etc. according the test requirements.

(3) Pre-service and in-service inspection:

Generally, it is required to meet code or standard used, but it must be carefully evaluated in interface part that different code or standard is used. Because there may be different inspection method is adopted for different code or standard.

For example, some welding defect happened on safety end of reactor pressure vessel in unit2 of Qinshan phase II. Initial welding procedure followed RCC-M, but Westinghouse was responsible for repair according to ASME.

Ultrasonic and γ ray examine is used for whole thickness of wall of safety end according to RSEM, but only ultrasonic examine is required for 1/3thickness of wall of safety end according supplement8, ASME volume11.

final decision was according to ASME to conduct inspection.

Recently NNSA is establishing a national verification system for pre-service and in-service inspection.

(4)Water chemistry:

Water chemistry specification must be evaluated carefully so that it is compatible with all materials for one system.

(5)Special issue for AP1000:

As a unit, feet or inch is used in ASME, After AP1000 is localized, for example wall thickness and diameter of pipe, will be changed, because international unit is used in china. Thus mass, elastic, etc. will change for pipe. Especially for rotate equipment and component, problem is how to choose tolerance.

So reevaluation and reanalysis must be conducted for localized AP1000. It is possible that necessary prototype test or

Qualification will be performed.

3.Chinese code and standard in future

Due to large nuclear power development program in China, it is impossible to import everything from other country. Therefore China must develop Chinese mechnacial code or standard for safety-classified components.

Several years ago, NNSA, National Energy Agency, National Defense Technology and Industry Agency, and National Standard Committee organized a leadership group to develop Chinese code and standard for nuclear power industry.

Now work is progressing.

Thank You

American Society of Mechanical Engineers (ASME)

Rick Swayne, Vice-President, ASME

ASME STANDARDS TECHNOLOGY, LLC

Code Comparison Project

ASME • AFCEN • JSME • KEA • CSA • NIKIET

Status Report

MDEP CSWG Meeting
Paris, France
15-16 September 2011

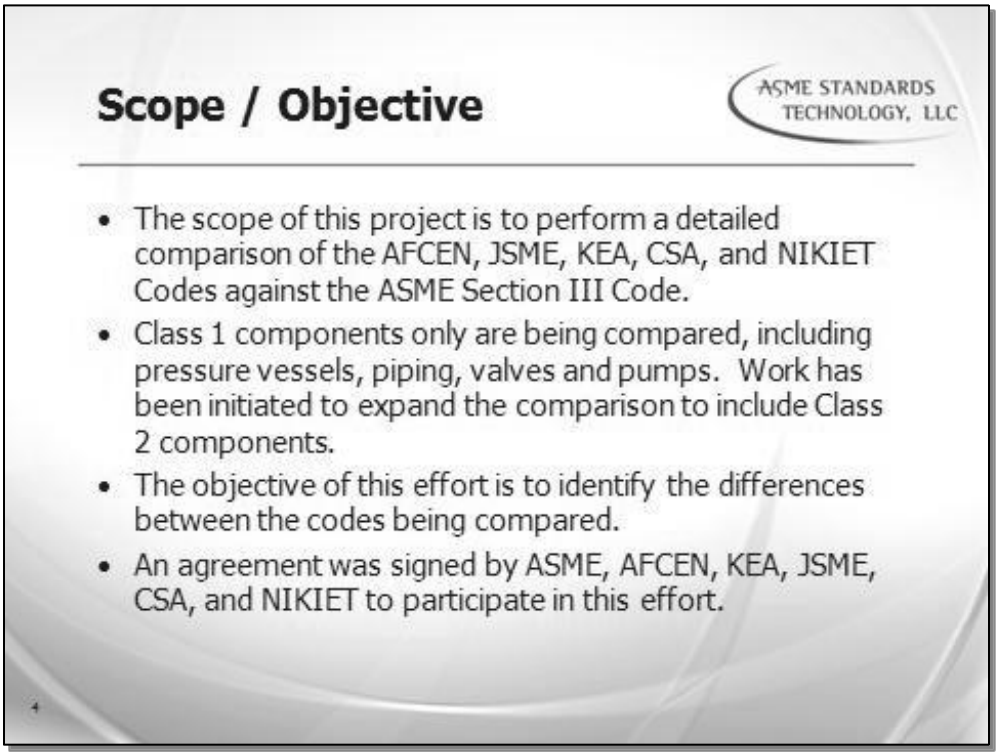
2

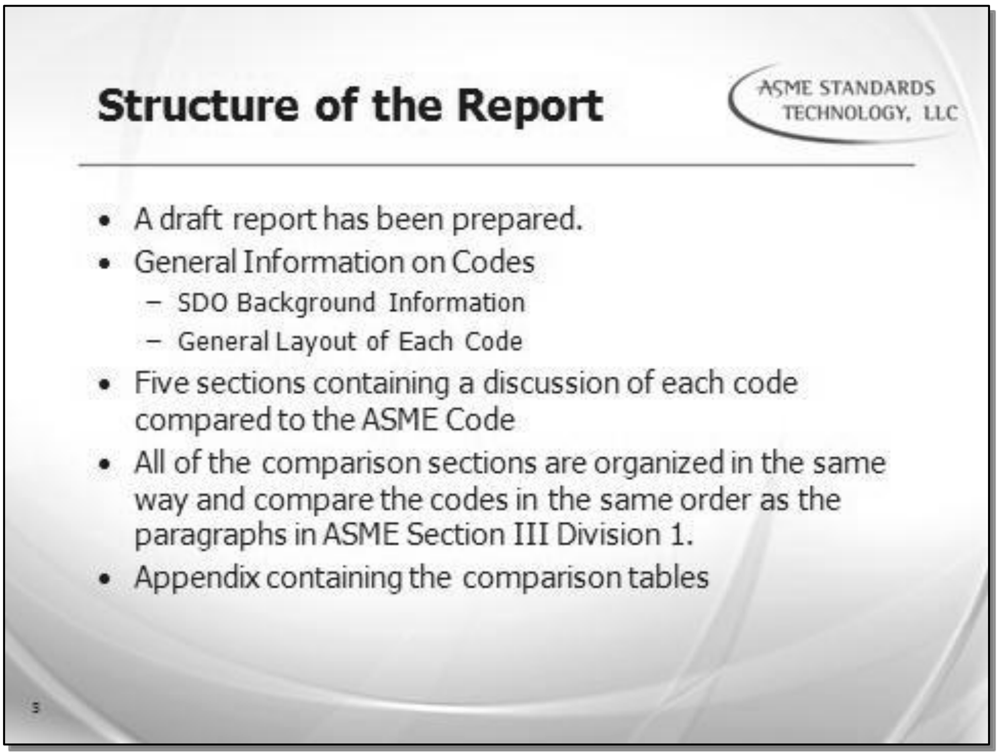
History / Background

ASME STANDARDS TECHNOLOGY, LLC

- ASME Standards Technology LLC (ASME ST-LLC) is managing the Code Comparison Project, which was initiated in response to a request by the Multinational Design Evaluation Program (MDEP) Working Group on Component Manufacturing Oversight (WGCMO).
- In an effort to facilitate as much as possible the consistent design and manufacturing processes between the ten MDEP countries for Class 1 components for nuclear power plants, WGCMO requested the Standards Development Organizations (SDOs) to develop a comparison of the requirements of their codes and standards.
- In view of the fact that years ago the ASME was the source of the codes to be compared, it was determined that the format of the comparison should be based on the ASME sections.

3


Scope / Objective
ASME STANDARDS TECHNOLOGY, LLC
• The scope of this project is to perform a detailed comparison of the AFCEN, JSME, KEA, CSA, and NIKIET Codes against the ASME Section III Code.
• Class 1 components only are being compared, including pressure vessels, piping, valves and pumps. Work has been initiated to expand the comparison to include Class 2 components.
• The objective of this effort is to identify the differences between the codes being compared.
• An agreement was signed by ASME, AFCEN, KEA, JSME, CSA, and NIKIET to participate in this effort.
4


Structure of the Report
ASME STANDARDS TECHNOLOGY, LLC
• A draft report has been prepared.
• General Information on Codes
– SDO Background Information
– General Layout of Each Code
• Five sections containing a discussion of each code compared to the ASME Code
• All of the comparison sections are organized in the same way and compare the codes in the same order as the paragraphs in ASME Section III Division 1.
• Appendix containing the comparison tables
5

Schedule for Publication of the Report

ASME STANDARDS TECHNOLOGY, LLC

- The draft report is in the final stages of review by the SDOs.
- An updated draft is expected to be submitted to the SDOs in October, for final comments.
- ASME will address all comments in November for final discussion in December.
- The SDOs will meet in Paris on December 4-5, in preparation for the meeting with the MDEP CSWG on December 6.

6

Differences

ASME STANDARDS TECHNOLOGY, LLC

- Regulatory requirements and limitations
  - Quality Assurance
  - Conformity Assessment
  - Allowable Stress Limits
  - Material selection
  - Design approval
  - Approved Notified Bodies
- Country standard industry practices
  - Welding qualification
  - Third party inspection
  - NDE personnel certification
  - NDE methods
  - Material specifications
- Compliance administrative requirements
  - Conformity Assessment
  - Stamping
  - Quality Assurance
  - Registered Professional Engineers
  - Authorized Inspection Agencies
  - Design Specifications
- Scope differences
  - Types of reactor designs
  - Material selection
  - Degree of detail specified
    - Attachments, Tolerances, Analysis, PWHT
  - Jurisdictional boundaries
  - Overpressure protection
  - Preservice Inspection

7

RCC-M Significant Differences

ASME STANDARDS TECHNOLOGY, LLC

- Most of the differences between ASME BPVC Section III and RCC-M can be classified in two categories: differences due to technical requirements or differences due to regulatory requirements.
- For Class 1 vessels, the RCC-M is more specific for PWR reactors; ASME has a larger scope than RCC-M and requires Design Specifications.

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RCC-M Significant Differences

ASME STANDARDS TECHNOLOGY, LLC

- ASME Section III requires accreditation of fabricators, manufacturers, and suppliers, and qualification of professional engineers; RCC-M does not have similar requirements.
- ASME Section III specifies preservice examinations in accordance with ASME Section XI requirements; RCC-M allows use of Owner-specified requirements for preservice examination.
- QA in RCC-M is based on ISO-9001 and IAEA standards and recommendations; ASME specifies use of ASME NQA-1 with additional requirements.

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JSME S-NC1 Significant Differences

ASME STANDARDS TECHNOLOGY, LLC

- JSME S-NC1 does not have requirements for quality assurance, however ISO-9001 is applied through regulatory and contractual requirements; ASME specifies use of ASME NQA-1 with additional requirements.
- ASME Section III requires evaluation of piping stresses due to seismic loads using an empirical formula. JEAC4601 (seismic code for Japan) requires fatigue analysis.
- Cutting, forming and brazing requirements are specified in Section III, but not in JSME S-NC1

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KEPIC-MN Significant Differences

ASME STANDARDS TECHNOLOGY, LLC

- Differences between KEPIC-MN and ASME Section III are largely related to differences in standard industry practice. They include differences in calibration standards and NDE personnel certification, for which KEPIC requires national certification based on Korean domestic law in addition to the requirements of ASNT SNT-TC-1A.

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CSA N285-08
Significant Differences

ASME STANDARDS TECHNOLOGY, LLC

- Differences exist between CSA N285-08 and ASME Section III because of the difference in reactor design. ASME Section III was written for light water reactors; N285 was written for heavy water reactors.
- CSA has developed a series of standards (N289 Series) that identifies the Canadian requirements for considering the evaluation and impact of seismic loadings on the pressure boundary items.

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NIKIET PNAE G-7
General Information

ASME STANDARDS TECHNOLOGY, LLC

- The scope of requirements in PNAE-G7 is much smaller than that of ASME Section III. Additional guidance is provided by standards from other organizations.
- PNAE-G7 provides technical requirements (standards) for fabrication of particular material product forms or particular parts or components.
- The specific feature of the standardization in the Russian nuclear sphere is the presence of a significant number of guidance documents and related standards. Therefore, requirements that are not specified in PNAE G-7 can be contained in the guidance documents and standards.

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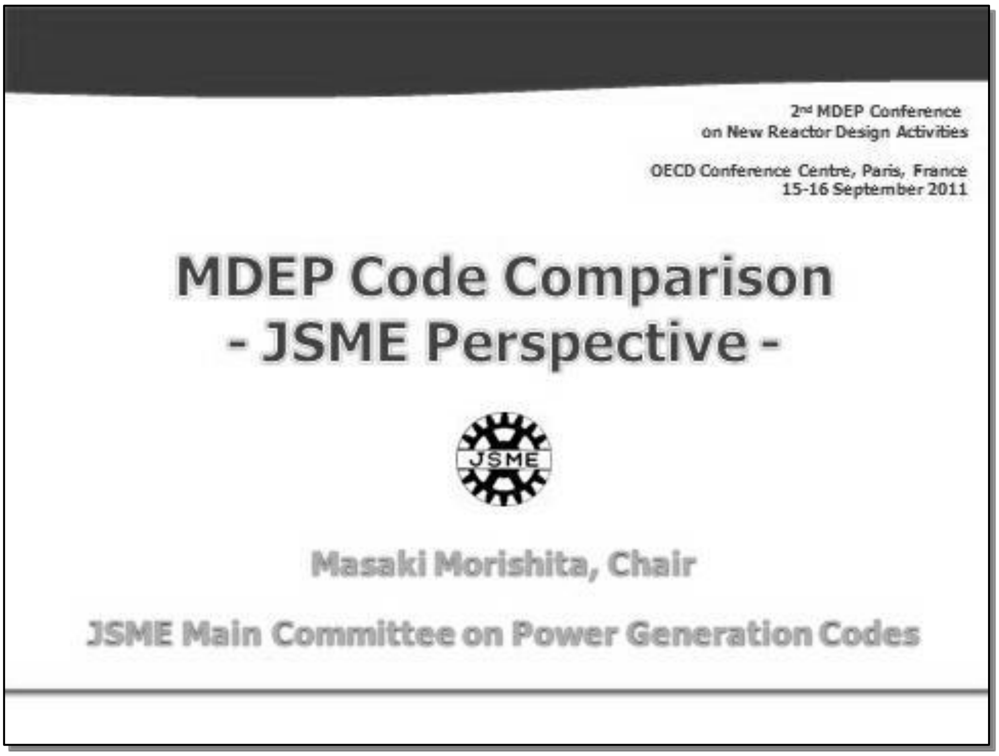
ASME STANDARDS
TECHNOLOGY, LLC
Your R&D Partner

Japan Society of Mechanical Engineers (JSME)

Masaki Morishita, Deputy Director-General, JAEA, JSME representative



Code Comparison Effort

Participating SDOs:

- ASME/USA
- AFCEN/France
- JSME/Japan
- KEA/Korea
- CSA/Canada
- NIKIET/Russia

Scope of Code Comparison:

- ✓ Class 1 component (vessel, pipe, pump and valve)
- ✓ Material, Fabrication, Design, Examination, Testing and Overpressure protection
- ✓ Detailed Line by line comparison → Comparison table

Meetings:

- ✓ CSWG meetings
  ….. April 2010, November 2010, April 2011, …..
- ✓ SDO meetings in conjunction with ASME Boiler Code Week
  Feburary, May, August, December in every year (Four times a year)

Status:

Draft SDO report nearly complete, expected to be presented to CSWG for review within this year

15-16 September 2011 2nd MDEP Conference OECD Conference Center, Paris 1

JSME / ASME Comparison

General conclusions of comparison

- ✓ Key technical requirements in JSME code are essentially the same as those in ASME Section III NB, especially for design (NB-3000)
- ✓ Typical difference include;
  - ✓ No stamping, no accreditation system, or no design report in JSME
- ✓ Differences are classified into;
  - ✓ Different requirement
  - ✓ Not addressed in JSME ← *Most of the differences fall into this category*
  - ✓ JSME unique
- ✓ Major sources of differences include;
  - ✓ Origin of JSME code is technical standard by regulatory authority
  - ✓ Industry's practice
- ✓ QA requirements are quite different:
  - ✓ ISO9001 and "Performance-base QA" in Japan vs. NQA/NCA and "Compliance QA" of ASME

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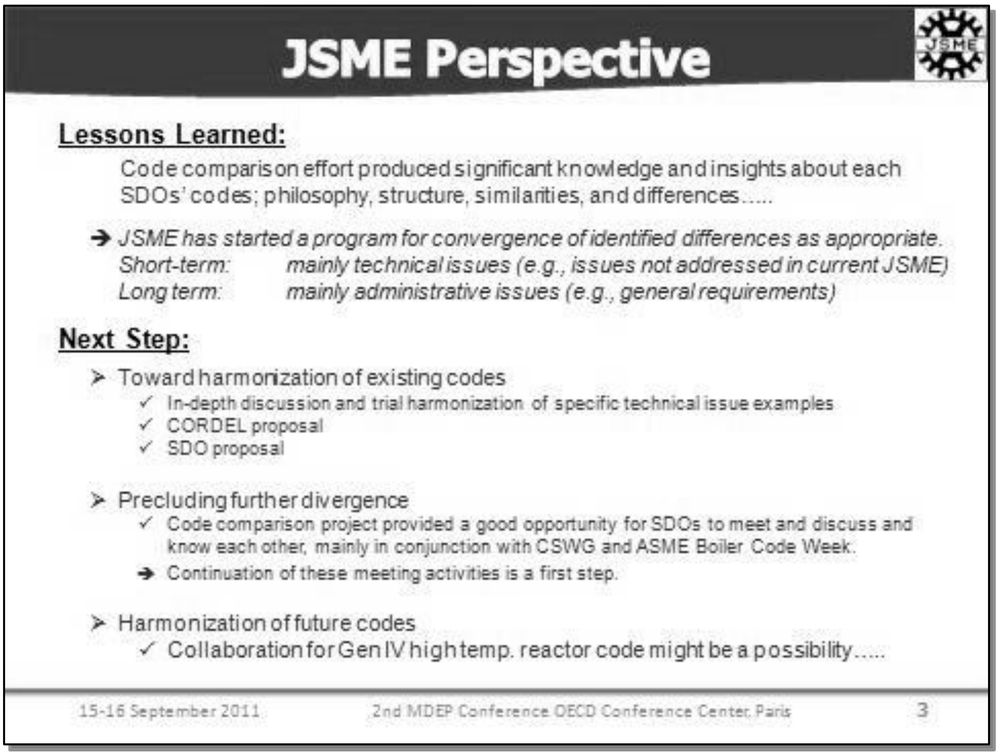
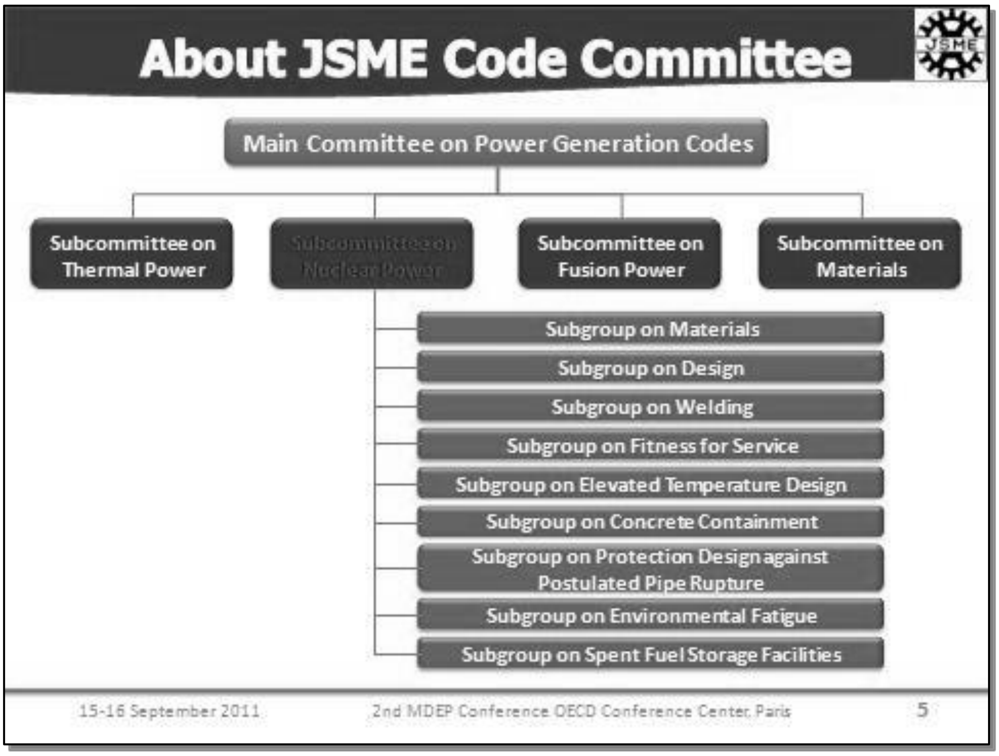

JSME Perspective
Lessons Learned:
Code comparison effort produced significant knowledge and insights about each SDOs' codes; philosophy, structure, similarities, and differences.....
➔ JSME has started a program for convergence of identified differences as appropriate.
Short-term: mainly technical issues (e.g., issues not addressed in current JSME)
Long term: mainly administrative issues (e.g., general requirements)
Next Step:
➢ Toward harmonization of existing codes
✓ In-depth discussion and trial harmonization of specific technical issue examples
✓ CORDEL proposal
✓ SDO proposal
➢ Precluding further divergence
✓ Code comparison project provided a good opportunity for SDOs to meet and discuss and know each other, mainly in conjunction with CSWG and ASME Boiler Code Week.
➔ Continuation of these meeting activities is a first step.
➢ Harmonization of future codes
✓ Collaboration for Gen IV high temp. reactor code might be a possibility.....
15-16 September 2011
2nd MDEP Conference OECD Conference Center, Paris
3


Thank you for your attention !
15-16 September 2011
2nd MDEP Conference OECD Conference Center, Paris
4



JSME Nuclear Codes

Codes for Nuclear Power Generation Facilities

- Rules on Materials for Nuclear Facilities *(under preparation)*
- Rules on Design and Construction for NPPs, Div. 1 LWRs
- Rules on Design and Construction for NPPs, Div. 2 FBRs
- Rules on Concrete Containment Vessels for NPPs
- Rules on Welding for NPPs
- Rules on Fitness-for-Service for NPPs
- Rules on Protection Design against Postulated Pipe Rupture for NPPs (LBB)
- Environmental Fatigue Evaluation Method for Nuclear Power Plants

Codes for Construction of Spent Nuclear Fuel Storage Facilities

- Rules on Transport/ Storage Packagings for Spent Nuclear Fuel
- Rules on Concrete Casks, Canister Transfer Machines and Canister Transport Casks for Spent Nuclear Fuel

Codes for Nuclear Fuel Reprocessing Facilities

- Rules on Design for Nuclear Fuel Reprocessing Facilities

Codes for Fusion Facilities

- Rules on Superconducting Magnet Structures

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JSME Current and Future Efforts

JSME current programs and future efforts include:

1) Enhance Code Scope
- Rules on Welding for Nuclear Fuel Reprocessing Facilities (under prep.)
- Rules on Fitness-for-Service for Nuclear Fuel Reprocessing Facilities (under study)

2) Development of QA Related Codes for Conformity Assessment
- Code of General Requirements (draft completed)
- Code of QA Requirements for Code Item Construction (ditto.)

3) Development of Codes for Severe Accident Management
- "Design Guideline for SA Management" (preliminary draft completed)
- "Structural Integrity Guideline" (under concept study)
- "Plant & Equipment Design Guideline for Nuclear Safety" (start study of concept design soon)

4) Code Restructuring with Reflecting MDEP Study Results
- Total reform of "Welding Code" (under discussion)
- Establishment of individual "Inspection Code" (ditto.)

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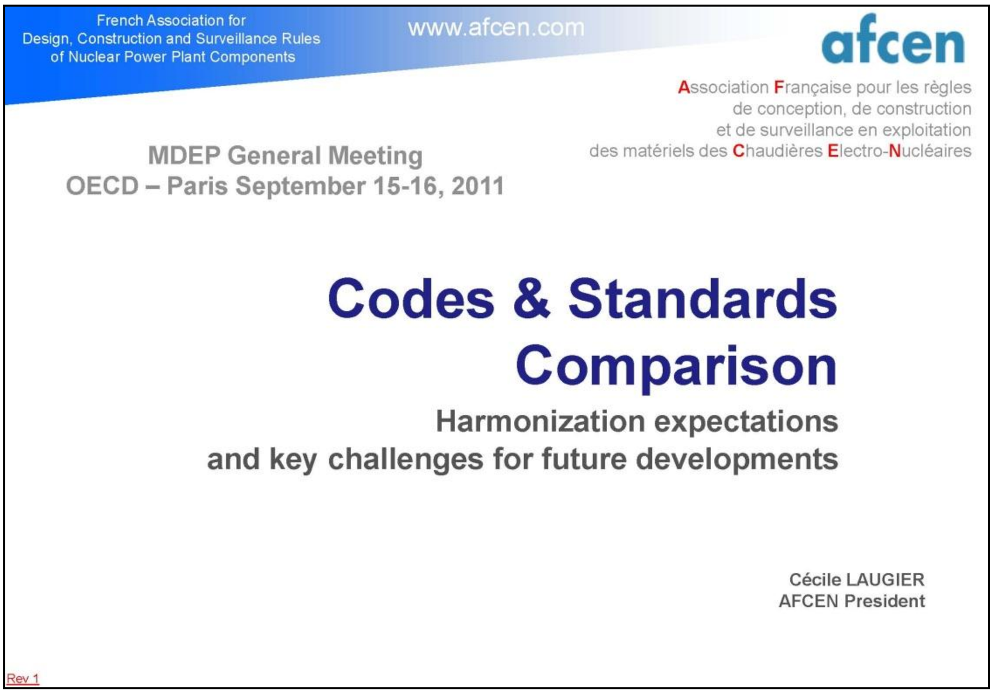
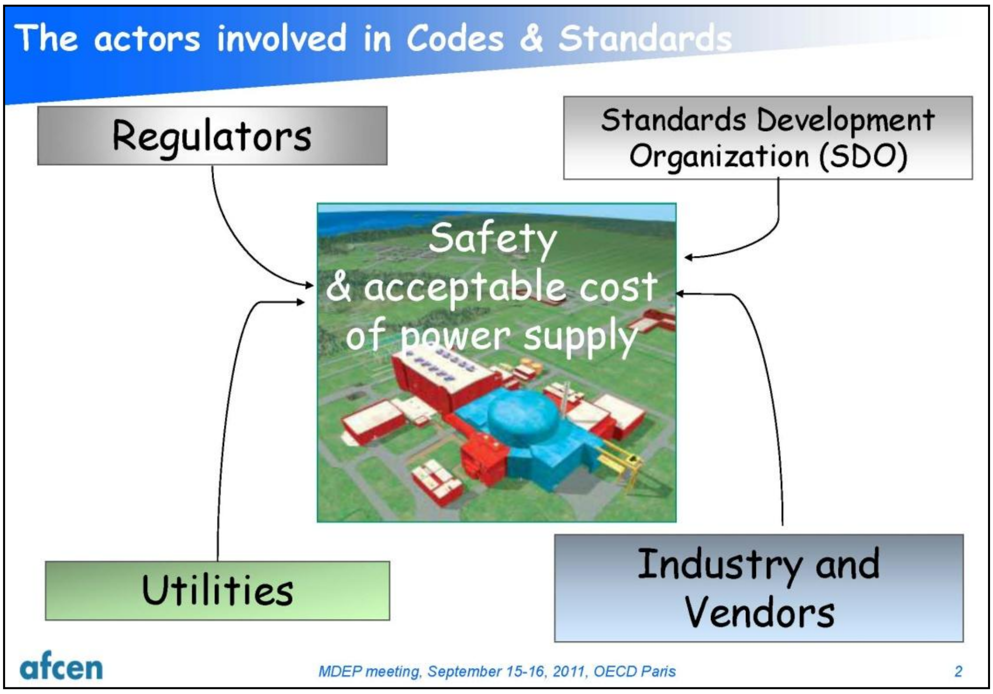
French Association for the rules governing the Design, Construction and Operating Supervision of the Equipment Items for Electro Nuclear Boilers (AFCEN)

Cécile Laugier, President, AFCEN





SDO ?

✓ **SDO's have to :**

- Assure High technical relevance and State Of the Art fitting for all disciplines
- Include all the construction and operation feedback
- Answer to different regulation:
  - Differentiate code and Authority requirement (Example: core part and annex of the RCC M)
  - Based on International or Recognized standards (Example: ISO, EN or ASTM standards)
  - Clearly identify Utility, Manufacturer, Supplier duties, whatever responsibilities are defined in national regulation. (Example: content of equipment specification)
- Gives tools to facilitate cooperation of the 3 other actors: at national and international level

✓ **How?**

- Harmonization of codes:
  - Codes should not be contradictory on technical rules
  - Codes should allow compatibility of practices, parts and components
- Open process of decision making and contributions
- Transfer of best and optimize practices to new generation of engineers

afcen MDEP meeting, September 15-16, 2011, OCDE Paris 3

Status of Code comparison

- ✓ **Comparison done for class 1 – Vessel, Piping, Pumps and Valves**
  - ➢ Final report available in 2012
  - ➢ Important disclaimer:
    - *"The reader is reminded that each of the codes is a set of consistent rules. The requirements of one area may be and often are dependent on the requirements in other sections. Since a line-by-line comparison has been done it is tempting to judge the entire code based on the differences between these individual points, but this may not lead to a correct conclusion. This exercise identifies the different requirements of the different codes. It was not within the scope of this report to provide conclusions relative to the full implementation of the various Codes."*

afcen | *MDEP meeting, September 15-16, 2011, OECD Paris* | *4*

Status of Code comparison

- ✓ **Identified Differences:**
  - ➢ Some are connected to national regulator requirements
  - ➢ Some are technical : no Sound Of Art level
  - ➢ Some are differences in Scope: mainly PWR / LWR, small components
  - ➢ Some are connected to Standards refer International / National
  - ➢ Some are related to ageing evaluation at design level
  - ➢ Some are related to operation consideration at design level
  - ➢ Some are connected to QA organization: in the Code totally or partly, referring to IAEA GS-R-3 / USNRC-NQA-1
  - ➢ Some are differences in level of prescription
    - more prescriptive but open to equivalent alternative
    - less prescriptive but needs more supplementary specifications to be developed

afcen | *MDEP meeting, September 15-16, 2011, OECD Paris* | *5*

How to reach Harmonization ?

- ✓ **Step by step process**
  - ➢ Example:
    - to work on Non Destructive Examination Certification of Personal in short or medium term; obtain a recognition of certification by each code;
  - ➢ Be supported by Cordel on these short, medium terms issues.
  - ➢ Be supported by Regulators for each harmonization objective, when they are in connection with regulation.
- ✓ **To be aware of solution of other codes for each new modification of any code; to avoid new contradictory rules.**

afcen MDEP meeting, September 15-16, 2011, OECD Paris 6

How to reach Harmonization ?

- ✓ **To integrate commonly best industry practices:**
  - ➢ Some codes need important Third Party involvement
  - ➢ Some codes are mainly based on Utility survey
  - ➢ Some codes are mainly based on Regulator inspection
  - ➢ Some codes are expecting a huge knowledge of Utility, through equipment specification requirement.

➔SDO have identified these differences, based on industrial, cultural, legal grounds: it's not a minor statement; technical differences are not the major ones!

➔Now, we know that nuclear industry is global, and best practices must be known and shared worldwide

➔Consequently a component, or a part of component, designed and fabricated with one Code, should be acceptable by Safety Authority for different International Project.

Safety Authorities must play their role to allow mutual recognition of different demonstrated best practices, whatever the code used.

Association Française pour les règles
de conception, de construction
et de surveillance en exploitation
des matériels des Chaudières Electro-Nucléaires

Thank you for your attention

French Association for
Design, Construction and Surveillance Rules
of Nuclear Power Plant Components

www.afcen.org

Rev 1 afcen

World Nuclear Association (WNA)

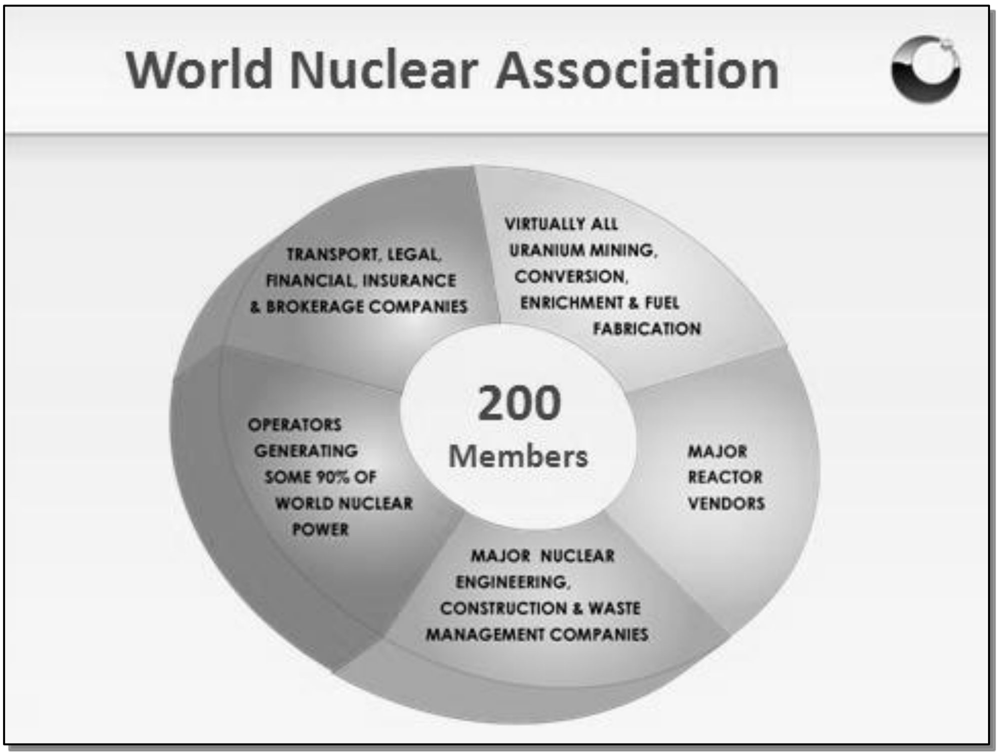
Nawal Prinja, Technical Director, AMEC/Hindustan Construction Company, WNA/CORDEL representative

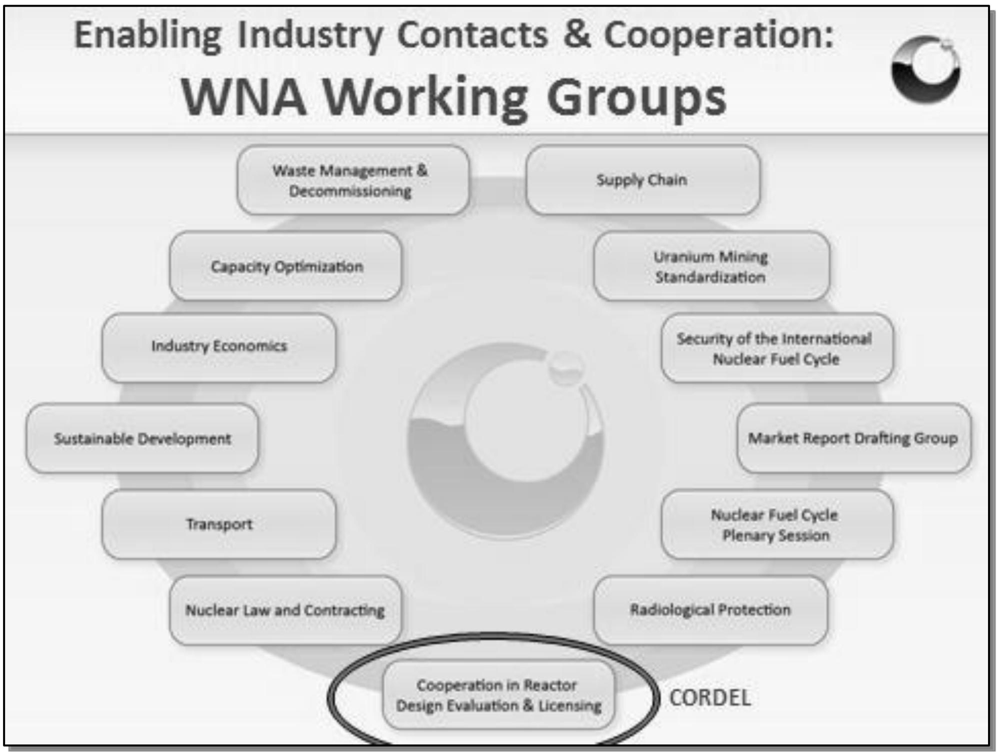
Presentation of WNA-CORDEL Pilot Project to MDEP Sept 2011

Pilot Project for Harmonisation of Codes & Standards applicable to nuclear reactor designs

Content

1. Introduction to WNA and CORDEL
2. Link with the MDEP Code Comparison Project
3. Scope of the Pilot Project
4. Design
   - **Allowable Stress Limits**
   - **Analysis methods**
   - **NDE methods**
5. Qualifications
   - **Engineers**
   - **Welders**
   - **NDE operators**
6. Project Plan
7. Resources


World Nuclear Association
TRANSPORT, LEGAL, FINANCIAL, INSURANCE & BROKERAGE COMPANIES
VIRTUALLY ALL URANIUM MINING, CONVERSION, ENRICHMENT & FUEL FABRICATION
200
Members
OPERATORS GENERATING SOME 90% OF WORLD NUCLEAR POWER
MAJOR REACTOR VENDORS
MAJOR NUCLEAR ENGINEERING, CONSTRUCTION & WASTE MANAGEMENT COMPANIES


Enabling Industry Contacts & Cooperation:
WNA Working Groups
Waste Management & Decommissioning
Supply Chain
Capacity Optimization
Uranium Mining Standardization
Industry Economics
Security of the International Nuclear Fuel Cycle
Sustainable Development
Market Report Drafting Group
Transport
Nuclear Fuel Cycle Plenary Session
Nuclear Law and Contracting
Radiological Protection
Cooperation in Reactor Design Evaluation & Licensing
CORDEL

The CORDEL Working Group

CORDEL - Cooperation in Reactor Design Evaluation and Licensing

- **Main aim: promoting international standardization**
- **Membership:** all major vendors, utilities interested in new build, service companies and observers from int'l organisations
- **International standardization means** that each vendor's design can be built in any country under national regulations which have been "harmonized" to a set of international requirements and standards
- **Standardized advanced plants will bring economic advantage and additional safety layers in all stages: design, construction, operation and decommissioning**

CORDEL – commitment from industry

13 April 2010, 12 Leading Nuclear Companies' CEOs published a letter of support for CORDEL:

- John Ritch, DG, WNA
- Anne Lauvergeon, CEO, Areva
- Hugh MacDiarmid, CEO, AECL
- Henri Proglio, CEO, EDF
- Wulf H Bernotat, CEO, E.On
- Christopher Crane, President & CNO, Exelon
- Jack Fuller, CEO, GE-Hitachi
- Masaharu Hanyu, President, Hitachi-GE
- Akira Sawa, Director, Nuclear Systems, Mitsubishi Heavy Industries
- Ichiro Takekuro, CNO, Tokyo Electric Power Co
- Yashuharu Igarashi, CEO, Power Systems Toshiba
- Aris Candris, CEO, Westinghouse

Recipients:

- Yukiya Amano, DG, IAEA
- André-Claude Lacoste, Chairman, Multinational Design Evaluation Program (MDEP)
- Luis Echávarri, DG, OECD-NEA
- Andrej Stritar, Chairman, ENSREG

cc: Laurent Stricker, Chairman, WANO

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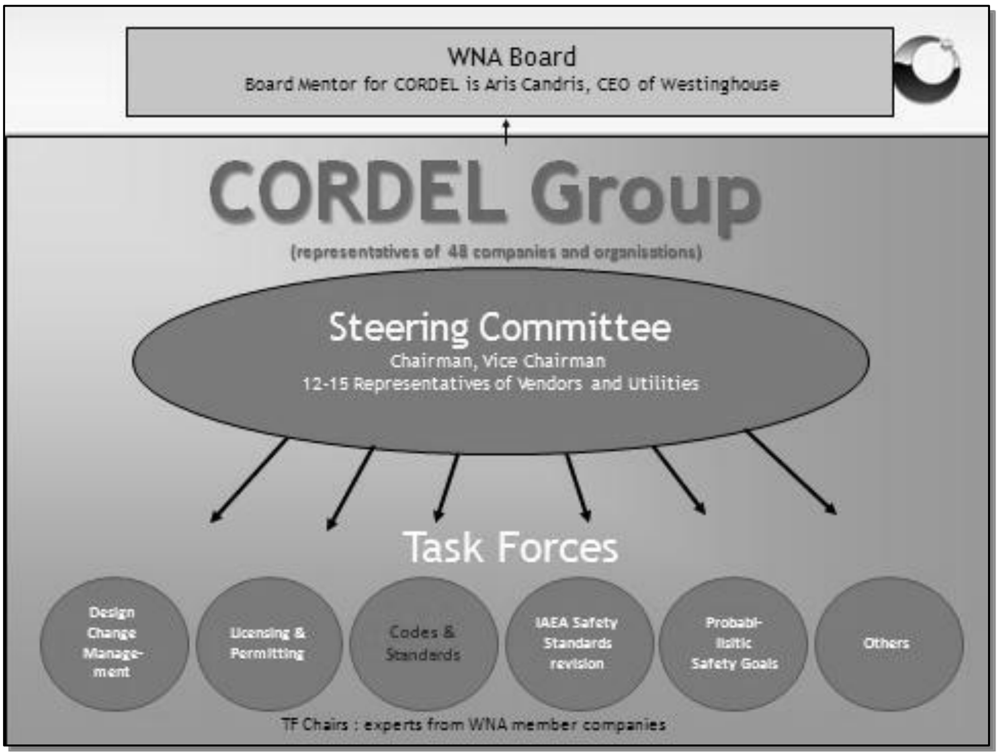
See www.world-nuclear.org → Publications
WNA Discussion Paper
Benefits Gained through International Harmonization of Nuclear Safety Standards for Reactor Designs
World Nuclear Association
2008
WNA Report
International Standardization of Nuclear Reactor Designs
World Nuclear Association
2010
3


WNA Board
Board Mentor for CORDEL is Aris Candris, CEO of Westinghouse
CORDEL Group
(representatives of 48 companies and organisations)
Steering Committee
Chairman, Vice Chairman
12-15 Representatives of Vendors and Utilities
Task Forces
Design Change Manage-ment
Licensing & Permitting
Codes & Standards
IAEA Safety Standards revision
Probabi-lisitic Safety Goals
Others
TF Chairs : experts from WNA member companies

CORDEL - Action Plan 2011

- **Interaction with MDEP** & other regulatory initiatives
- **IAEA safety standards:** continuous participation in revision
- **Design Change Management Task Force (TF):** develop institutional mechanisms in the industry to enable compliance with standardization throughout standard fleet's lifetime
- **Standards and codes TF:** cooperation with SDOs of various countries in convergence of industry codes
- **Probabilistic safety goals TF:** promotion of harmonization of industry's methodologies and values
- **Licensing and permitting TF:** industry interests – efficiency & risks reduction; also in support of emerging markets
- **SMRs TF:** encouraging commercial development

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Promotion of Harmonization of Standards and Codes

- **WNA CORDEL is one of many stakeholder in the Industry sector**
  - Interfaces with regulators and standardization organisations
- **Support to existing initiatives for comparison and towards harmonization of standards and codes**
  - MDEP working group on digital instrumentation and controls (with IEEE and IEC)
  - Contacts with ISO TC85 for more ISO endorsements of national standards
  - Possible future initiative on concrete structures codes
  - **MDEP work on mechanical codes : ASME III, AFCEN (RCC-M), KEA (KEPIC), JSME (S-NC1): 1st priority**

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MDEP Code Comparison Project

Main Reasons for Differences in the Codes & Standards

- General Requirement Practices
  - Quality Assurance Requirements (NQA-1, ISO 9001, IAEA 50/SG)
  - Conformity Assessment (Stamping, RPE)
  - Local qualifications for welding and NDE
  - Local reference materials
- Scope of Codes
  - CSA – Candu reactors
  - AFCEN – PWR
  - ASME, JSME, KEA, and CSA – BWR, PWR, Candu
- Flexibilities allowed due to variation in country practices
  - Operational experience (prescribed in AFCEN)
  - Design and Analysis Flexibility (analysis methodology specified in AFCEN)

Harmonisation

- It is recognised that all differences cannot be resolved but some progress towards convergence and mutual recognition could be achieved in the short- to medium-term.
- The proposed Pilot Project will be focused on design codes and standards only in the two areas :
  - Technical design
  - Personnel qualifications.
- The need to harmonise does not imply non-compliance but should be considered as achieving equivalent status in other countries.

Scope of the Pilot Project

- Select some of the specific topics from the Code Comparison Project
- The proposal is based on the discussions held with the SDOs and MDEP/CSWG in April 2011 and Aug 2011.
- There are two areas of priority :

  1) the stress allowables and analysis methods used in the design of pressure equipment

  2) qualifications of welding and NDE/T operators.
- The pilot project is to be run in agreement with the SDOs and Regulators (CSWG members) based on the acceptance in principle to harmonise the design codes and the associated QA requirements.

Design Issues

In order of priority

- Allowable stress limits
- Nonlinear analysis
- Permitted Analysis Methods
  - Plastic collapse, shakedown, fatigue, seismic
- NDE methods
- Evaluation of Nozzle Loads
- Vessel openings/ Penetrations and Reinforcements
- Material specifications
- Mechanical Joint Design Methods
- Jurisdictional boundaries
- Overpressure protection

Basis for stress categorisation

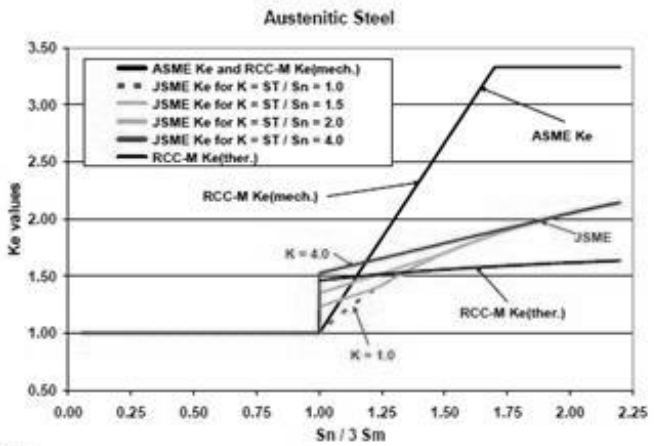
- Codes do not correlate FEA stress distribution to failure modes. So it is open to interpretation.
- Code limits were developed for 1D or 2D geometries but now it is common to use FEA for 3D geometries
- Harmonisation of methods to extract membrane & bending stresses from 3D nonlinear distributions
- Harmonisation of Primary + Secondary range
- General guidance on linearisation and design code compliance

Allowable Stress Limits

- The standard classification of stresses used in design codes
- Harmonised definition of events under "normal", "upset", "emergency" and "faulted" conditions. Earthquake and other dynamic events also assessed differently. These approaches should also be harmonized
- The allowable stress limits (Primary, Secondary, Peak and their combinations for different Service levels representing normal, abnormal and extreme events)
- Limits for cyclic loads (mechanical, thermal and combinations) and analysis methods
- The numerical procedures used to post-process stress analysis results particularly the application of stress linearisation procedures

Example: Variation in the Ke Factor for Fatigue Assessment in Different Codes

Figure 1: Comparison of Ke functions [ASME-Code vs. JSME-Code vs. RCC-M]



Notes:
1.) the RCC-M Ke(ther.) is to be applied on the axial temperature gradient stress range (Ta / Tb stress) and on the radial temperature gradient stress range (DT1 and DT2 stresses)
2.) the B31.7 Methodology is not shown in the Figure above.

K is the Stress Conc Factor

Taken from SMiRT -19, Toronto paper F04/2 by Rami Hawileh et al (Areva)

Qualifications

- Registered Professional Engineers
  - Competency measures for analysis and design
  - Survey of available competency profiles
  - Draft harmonised profile
- Welding qualifications
  - Types of welds
  - Performance qualifications
  - Renewal of qualifications
  - Harmonised training profile
- NDE/T personnel certification
  - Training and experience hours
  - Testing and recording of competency

Professional Engineer Qualifications

- We understand ASME is considering to update its section NB5500
- That could be an opportunity to work with ISO and achieve harmonisation with ISO 9712
- EU is funding EASIT2 project for harmonisation of analysts skills and training
- To be focussed on design and analysis competencies

Project Plan

- Develop details after discussions with SDOs on 6 Aug in Boston
- CORDEL members to nominate experts from their companies to participate in this work.
- 13 September 2011, London: CORDEL C&S TF meeting
- 15-16 September, Paris: CORDEL C&STF reports at the MDEP Conference. The future actions will be determined accordingly.
- Appoint experienced consultants to conduct technical reviews of codes comparison.
- A communication plan of promoting Codes and Standards harmonization with governments and law makers to be developed.
- Seminar on C&S Harmonisation.
- Interactions with the following standards organisations is planned:
  - ISO
  - IEEE, IEC and other electrical and Digital I&C standards organisations
  - Civil & structural codes organisations (ASCE, ACI and Eurocode committees etc)
- Further plans to be determined during CORDEL September 2011 and January 2012 meetings.

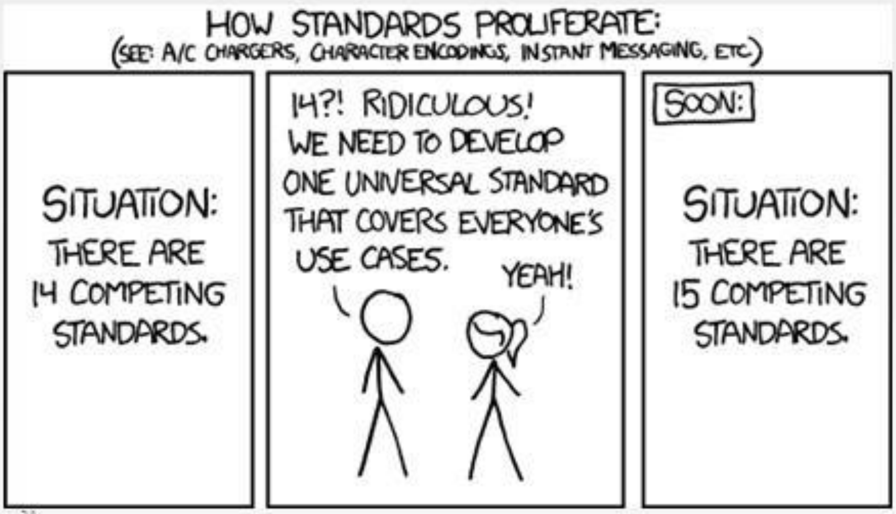
Resources

- CORDEL C&S TF Chair: Professor Nawal Prinja (Technical Director of AMEC and Hindustan Construction Company), over 31 years of experience in different types of nuclear reactors with specific responsibility for codes and standards in his company
- International Experts: One or two experts on NDE/T qualifications and certification will be engaged by CORDEL as consultants for this pilot project.
- Technical Officer: WNA has employed a PhD researcher Andrew Wasylyk who has knowledge and experience of structural integrity issues.
- Administration: The project will be administered by the WNA Secretariat in London under supervision of Irina Borysova.

Dissemination

- The outcome of this Pilot Project will be disseminated through
  - SDOs
  - MDEP
  - ISO
  - WNA / WNU
  - Stakeholders from Industry

Thank you!



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World Nuclear Association

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SESSION 5

FUKUSHIMA-RELATED ISSUES

SESSION 5 SUMMARY

André-Claude LACOSTE, MDEP PG Chair, replaced Mr. Mike WEIGHTMAN as chair of this session. The following persons made remarks and/or gave presentations on the Fukushima related issues:

- Koichiro Nakamura, Japan PG member and deputy director general of NISA, gave a presentation of the current status and efforts regarding the TEPCO Fukushima Dai-ichi accident;

- Gregory Jaczko, United States PG member and chair of the US NRC, gave a presentation on the US NRC's actions following the Fukushima accident;

- Jukka Laaksonen, Finland PG member and chair of STUK and WENRA, gave a presentation on the design issues to be considered on the basis of Fukushima lessons;

- Youn-Won Park, Korea PG member and president of KINS, gave a presentation of Korea response to Fukushima related issues

- Kevin Allars, United Kingdom PG member;

- Laurent Stricker, chair of WANO, gave a presentation on new reactors vendors' and licensees' responses to the Fukushima related issues.

The presentation by Mr. Nakamura of the Fukushima Dai-ichi accident summarised the short term (months) efforts undertaken to gain control of the situation and the mid (3 years) and long term ones that remain toward the decommissioning, with the roadmap detailed. Also were presented the monitoring of the environment and the exposure of residents and workers, with measurements of dose rates, setting of evacuation areas and surveillance of agricultural products. The regulatory framework will evolve to incorporate lessons learnt regarding emergency preparedness and design reviewing. The major step will be the creation of a regulatory body independent from the ministry of industry in early 2012.

Then, a presentation was given regarding the US NRC immediate response to the accident and the details about the near term task force work and recommendations. MDEP's role as an opportunity to share regulatory evolutions regarding these issues was underlined.

Concerning the design issues raised after the Fukushima accident, the presentation addressed that the current international safety standards need to be consolidated with site specific hazards and features and common cause failures reassessment (physical protection and separation, redundancy, increased diversity, connections for mobile equipment).

The Korean inspections carried out to NPPs following the Fukushima accident were detailed in the presentation of the Korean representative. Focuses were the design in light of potential natural disasters, severe accidents and emergency preparedness. Several improvements were identified, such as the availability of power supplies and water in case of any events and the need to address issues regarding multiple units on the same site. Korea hosted the first IRRS mission following the Fukushima accident. Follow up issues were included in each of the topics forming the review. To conclude, a major step in the nuclear regulation of Korea will be the creation of a new organisation, the Nuclear Safety and Security Commission, not under the responsibility of the ministry of industry anymore.

WANO issued a SOER in March 2011, to which 100% of WANO members answered. Gaps that need to be addressed were identified in emergency preparedness of each utility in term of procedures, equipment availability and training. Concerning WANO, commitment was taken to reinforce the emergency team and the co-ordination with international organisations.

Mr. Lacoste stated that after the Fukushima accident, each country is undertaking its action plan to address the safety issues and some countries are pursuing regional action plans such as in Europe. The MDEP representatives will stay aware of the evolving issue and incorporate as necessary the relevant topics into MDEP activities.

Japan Nuclear and Industrial Safety Agency (NISA)

Koichiro Nakamura, Member of PG, Deputy-Director General, NISA

Contents

2

1. Efforts to bring the Fukushima accident under stable control

3

(1) Current Status

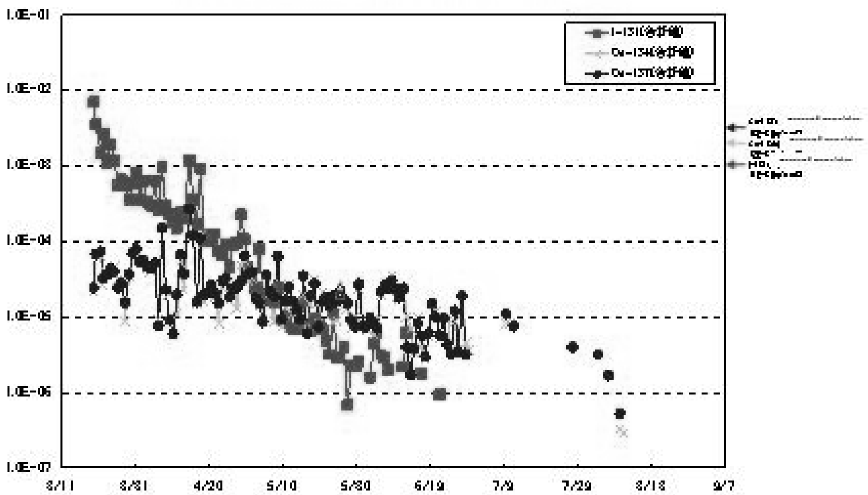
Undertaking measures in a comprehensive manner to achieve the cold shutdown of reactors and mitigate additional releases of radioactive materials to the greatest possible extent

- Conducting cooling by processing accumulated contaminated water and circulating it, leading to:
  - Reactor vessels (Units 1-3): Trending steadily at around 100°C
  - Spent fuel pools: Trending at 20 ~ 40°C
- Dispersing antiscattering agents and removing debris, to help hold down the release of radioactive materials
- Substantially decreased radiation entering the sea by installing a silt fence; installed and are now operating a circulating seawater decontamination system
- Decreases in the air dose rate measured by monitoring posts prove the validity of these claims. The GOJ publicly releases these results.

4

Transition of the air dose rate at the Fukushima Dai-ichi Nuclear Power Station

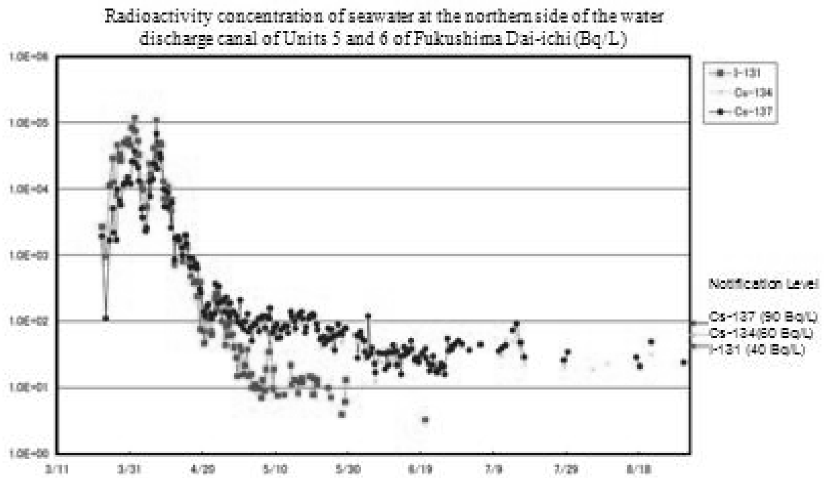
Analysis results of nuclides found in dust collected at the west gate of Fukushima Dai-ichi NPS (Bq/cm²)



Analysis results of nuclides found in dust collected at the west gate of Fukushima Dai-ichi NPS

5

Transition of the concentration of radioactive materials in seawater at the Fukushima Dai-ichi Nuclear Power Station



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Status of Units 1, 2 and 3 of Fukushima Dai-ichi NPS (As of September 14)

Item	Unit 1	Unit 2	Unit 3	Unit 4
Status of water injection into the reactor	Fresh water feeding via feed water system Flow rate: 3.7m^3/h	Fresh water feeding via feed water system Flow rate: 3.7m^3/h	Fresh water feeding via feed water system and core spray system Flow rate: 7.0m^3/h	*Unit 4 is not subject to these efforts (fuel already removed from the reactor prior to the earthquake)*
Temperature around the reactor vessel	Temperature in feed-water nozzle: 90.0°C Temperature at reactor vessel bottom: 84.9°C	Temperature in feed-water nozzle: 106.6°C Temperature at reactor vessel bottom: 114.4°C	Temperature in feed-water nozzle: 105.8°C Temperature at reactor vessel bottom: 101.3°C	
Situation of the spent fuel pool	Water temperature has been stabilized at approximately 30°C by means of an alternative cooling system	Water temperature has been stabilized at approximately 34°C by means of an alternative cooling system	Water temperature has been stabilized at approximately 33°C by means of an alternative cooling system	Water temperature has been stabilized at approximately 41°C by means of an alternative cooling system

* These data may be modified pending the results of TEPCO evaluations.

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(2) "Roadmap"

Under the "Roadmap" laid out:

•Step 1

Targets: Steadily decrease radiation releases, make progress in efforts to cool the reactors and spent fuel pools, make progress in the treatment of accumulated water → *completed*

•Step 2

Targets: Bring the release of radioactive materials under control between Oct. 2011 and Jan. 2012, hold down radiation exposure dose significantly through achieving cold shutdown of the reactors

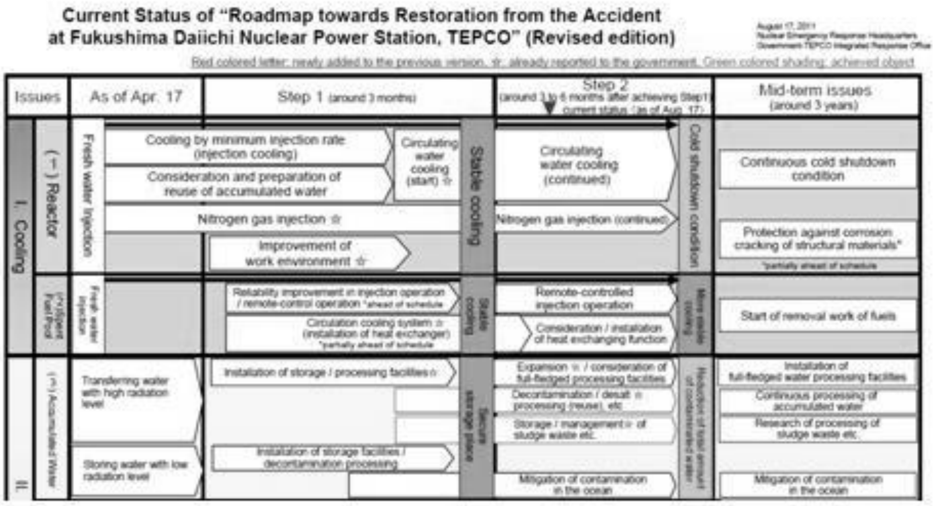
•Mid-term challenges

Removing spent fuel from the spent fuel pools, designing and constructing barriers for groundwater, continuing with decontamination efforts

Long-term challenges

Among others, includes the reconstruction of primary containment boundaries, the extraction and storage of debris, the management and disposal of radioactive waste, and decommissioning.

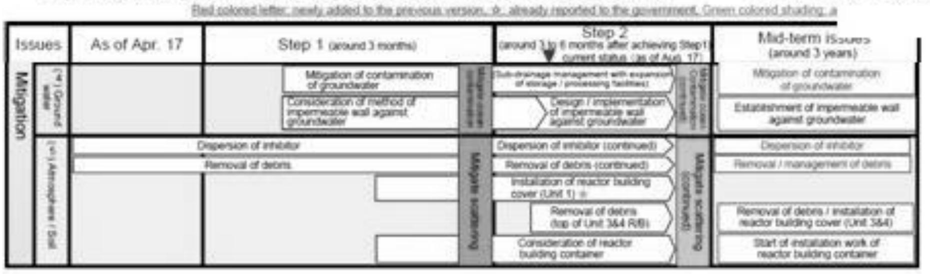
(2) Roadmap



(2) Roadmap

Current Status of "Roadmap towards Restoration from the Accident at Fukushima Daiichi Nuclear Power Station, TEPCO" (Revised edition)

Appendix 3



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Situation regarding radiation exposure (Local residents)

- Local authorities have launched the "Health Management Survey in Fukushima Prefecture," which targets 2 million people:

  - A basic survey based on behavioral records.

  - A detailed survey, based on the results of the basic survey implemented (estimated to be conducted on 200,000 people)

  - Supersonic thyroid examinations, to be implemented on all residents who were 18 years old or younger at the time of the accident

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Situation regarding radiation exposure (Workers at the plants)

- The total values of external and internal exposure:
  - 22.4 mSv (the average of 3,715 people, March)
  - 3.9 mSv (the average of 3,463 people, April)
  - 3.1 mSv (the average of 2,712 people, May)
- In March, it was confirmed that six people had exposure exceeding 250mSv, which is the dose limit for emergency workers

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(3) Additional information and knowledge

- ***Earthquake and tsunami***
  TEPCO has reported to the government its analysis indicating that the major facilities' safety functions were maintained.
- ***Nuclear reactors and spent fuel pools***
  According to TEPCO's report, there is a high probability that the exposure of fuel has been avoided by maintaining the water levels of the spent fuel pools.

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2. Responses to people affected by the accident

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(1) Comprehensive monitoring plan

☐ ***Implementation plan***

1) General environment
   ○ Nationwide monitoring
   ○ Monitoring of the land area, mainly around TEPCO's Fukushima NPSs
   ○ Sea area monitoring
   ○ Monitoring at schools and other such locations
2) Plan for the monitoring of ports, airports, parks, sewage, etc.
3) Plan for the monitoring of the water environment (water resources, rivers and lakes, groundwater, and bathing resorts), natural parks, and waste
4) Plan for the monitoring of cultivated soils, forests, and pasture grass
5) Foodstuffs (agricultural products, forestry products, livestock products, fishery products, etc.)
6) Monitoring of tap water

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(1) Comprehensive monitoring plan

- MEXT collected soil at about 2,200 places within a roughly 100 km radius from TEPCO's Fukushima Dai-ichi NPS while also measuring the air dose rate and the amount of radioactive materials deposited into the soil at these locations.

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Measuring the air dose rate

Air dose rate map

As of Aug. 11, 2011

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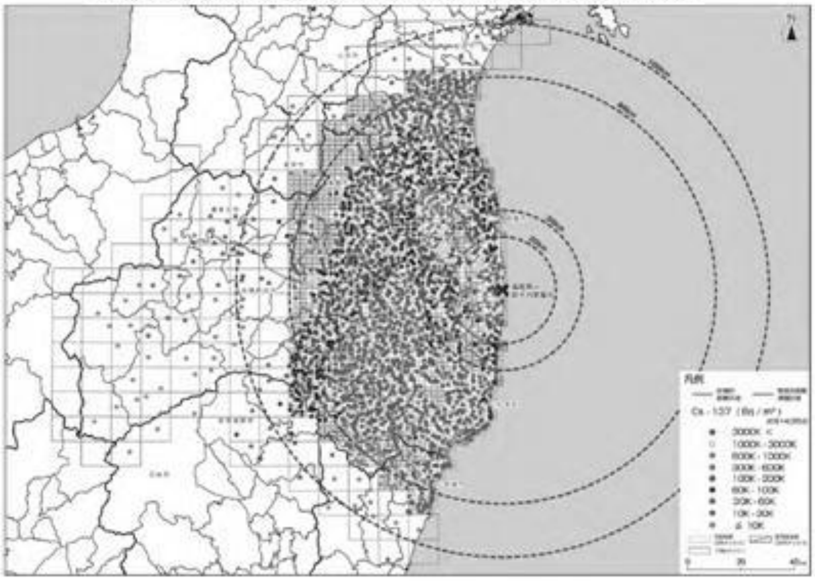
Amount of radioactive materials deposited into the soil

Map indicating radioactive cesium-137 concentration in soil



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(2) Efforts concerning decontamination

- ***Basic Policy for Emergency Response on Decontamination Work***

- ***Working principle (over the next two years)***

    1. The GOJ promotes decontamination, with the goal of reducing the estimated annual exposure dose to below 20 mSv where the current estimated annual exposure dose exceeds 20 mSv.
    2. Areas where the estimated annual exposure dose is below 20mSv, with a goal of bringing the estimated annual exposure dose to close to 1mSv.
    3. High priority is placed on achieving thorough decontamination in children's living areas (e.g. schools, parks)

- ***Individual efforts concerning decontamination***
    - Decontamination efforts at schools
    - Monitoring and decontamination of agricultural soils
    - Dose reduction of public facilities, school zones
    - Decontamination of residents' living spaces
    - Decontamination efforts by municipalities

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(3) Responses to people affected by the accident

- ***Restricted Areas***
  Evacuation areas to which access is prohibited, except in extremely limited circumstances (temporary access for residents, temporary access in the public interest)

- ***Deliberate Evacuation Areas***
  Areas where the cumulative dose might reach 20mSv within a year; evacuation takes place in a planned, deliberate manner over roughly a month, rather than immediately

- ***Evacuation-Prepared Areas***
  "Stay indoors" areas and/or areas where evacuation might become required should an emergency arise. (Efforts are underway to enable the lifting of this designation.)

- ***Specific Spots Recommended for Evacuation***
  Identified residences where exposure might reach 20mSv in a year; total of 227 locations (245 households)

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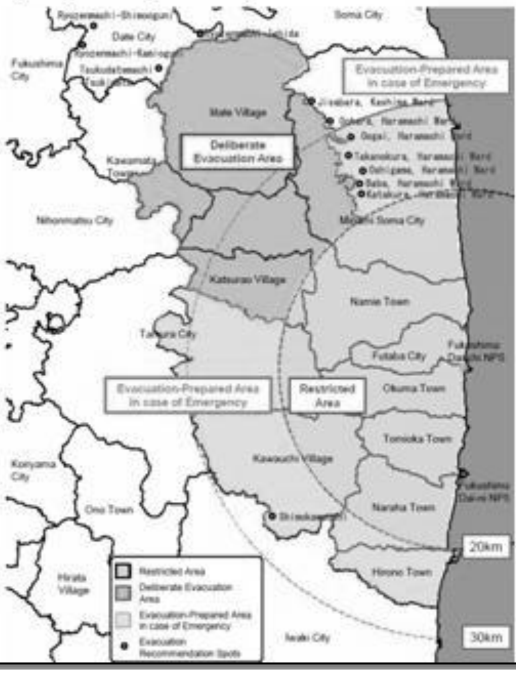
Restricted Areas, Deliberate Evacuation Areas, Evacuation-Prepared Areas in Case of Emergency and Specific Spots Recommended for Evacuation

(As of August 3, 2011)



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(3) Responses to people affected by the accident

- ***"Concept of Review of Evacuation Areas, etc."***
  (decided August 9 by the Nuclear Emergency Response Headquarters)
  1. maintain necessary distance as a result of safety evaluation
  2. Result of radiation monitoring in the areas
  3. Development of restoration plan

→ The GOJ intends to lift the designation of Evacuation-Prepared Area in Case of Emergency in blocks when all local municipalities have completed the development of a restoration plan, taking their residents' intentions into consideration.

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(4) Measures to address agricultural products

- The GOJ promotes the inspection of agricultural products, restricting distribution as necessary when radiation levels exceed the provisional regulation values

- Products whose radiation levels exceed the provisional regulation values must be recalled and destroyed (restricting distribution as necessary)

- Efforts regarding food items
  Tea leaves, beef, rice, etc.

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3. Efforts to address lessons learned

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(1) Reforms to safety-related regulatory and administrative systems

(1) The "Nuclear Safety and Security Agency (NSSA; tentative name)" will be created as an affiliated organization (*"gaikyoku"*) of the Ministry of Environment in view of "the separation of nuclear regulation and promotion," separating the nuclear safety regulation section of the Nuclear and Industry Safety Agency (NISA) from the Ministry of Economy, Trade and Industry (METI) and integrating the functions of the Nuclear Safety Commission (NSC).

(2) Aiming to further strengthen its functions as a regulatory organization by unifying work related to nuclear safety regulation, the NSSA will also be in charge of safety regulations on the use of reactors and nuclear fuel materials and nuclear security, and lead functions in environmental monitoring (including the operation of SPEEDI).

(3) Crisis management, including emergency responses, is one of the primary roles of the NSSA, and necessary arrangements will be made for this purpose.

(4) In order to steadily implement operations of the new organization, the government will make every effort to secure competent human resources from both the public and the private sectors.

(5) In parallel with the organizational review, the government will also conduct a review on the contents of nuclear regulations and their related systems, including the introduction of a new regulatory framework in view of the recent accident.

(6) The Cabinet Secretariat will carry out preparation work, including drafting necessary bills, aiming to create the NSSA in April 2012.

(7) When the relevant outcome from the Investigation Committee on the Accident at the TEPCO's Fukushima Nuclear Power Stations is presented during the course of the review, the government will respond to it in a flexible manner.

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(2) Countermeasures to reinforce safety at nuclear plants

☐ ***Emergency safety countermeasures***

Completed disposition of emergency response equipment; now working out manuals and drills.

Mid- to long-term efforts include countermeasures against flood damage.

☐ ***Urgent protective actions***

Completed ventilation of center operating room; now working out manuals for exhaust of hydrogen gas, and deployment of wheel carriers.

Mid- to long-term efforts include countermeasures against hydrogen leakage and the installation of hydrogen exhaust ports.

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(2) Countermeasures to reinforce safety at nuclear plants

☐ ***Total safety countermeasures***

Implementation of a new safety evaluation scheme, referring to safety assessments which EU countries have introduced.

First assessment: To be conducted after completing a regularly-scheduled inspection

Second assessment: To be conducted at all plants

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(3) Reviewing regulatory guides and standards

- Regulatory Guide for Reviewing Safety Design of Light Water Nuclear Power Reactor Facilities
- The Regulatory Guide for Reviewing Seismic Design of Nuclear Power Reactor Facilities
- Regulatory Guide for Emergency Preparedness of Nuclear Facilities

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http://www.iaea.org/newscenter/focus/fukushima/japan-report2/japanreport0911.pdf

Thank you

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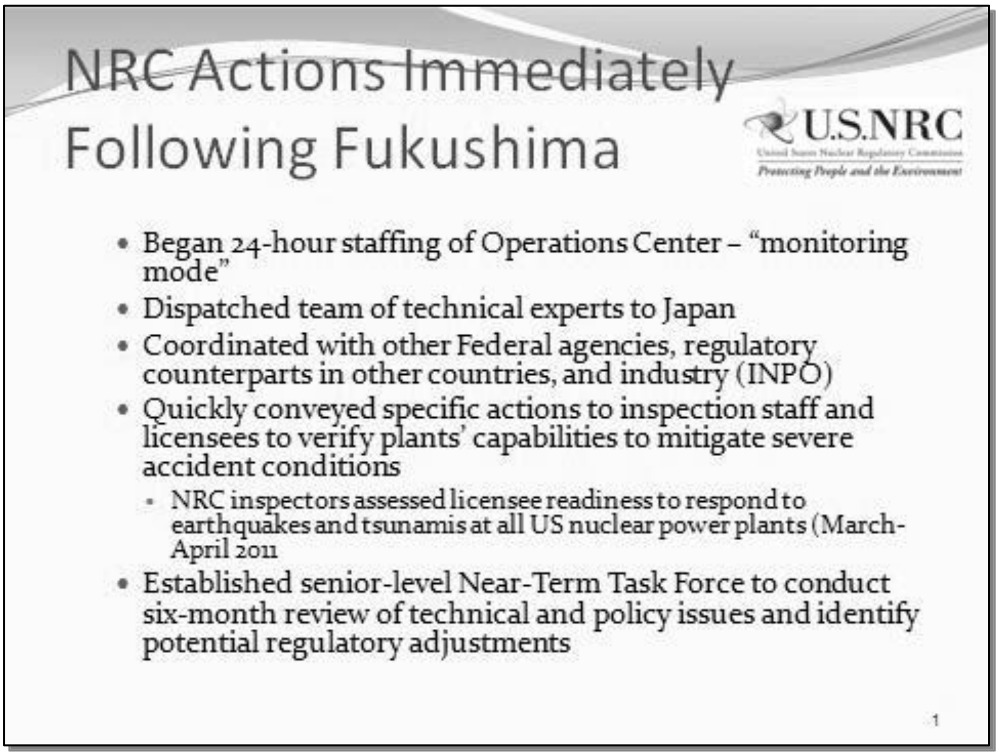
United States Nuclear Regulatory Commission (US NRC)

Gregory Jaczko, United States PG Member, Chair, US NRC



Subsequent and Planned NRC Actions

U.S.NRC
United States Nuclear Regulatory Commission
Protecting People and the Environment

- NRC inspectors followed up the March inspection by assessing licensee readiness to implement guidelines to manage severe accidents at all US nuclear power plants (May-June 2011)
- Near-Term Task Force Report issued: "Recommendations for Enhancing Reactor Safety in the 21st Century" (July 12, 2011)
- Commission Issued Staff Requirements Memorandum with Next Steps (August 19, 2011):
  - By 8/26/2011, develop a charter for the structure, scope, and expectations for assessing the Task Force recommendations (Completed)
  - By 9/9/2011, identify Task Force recommendations that can be implemented without unnecessary delay. (Completed)
  - By 10/3/2011, recommend a prioritization of all the Task Force recommendations. (In progress)
  - Advisory Committee on Reactor Safeguards (ACRS) will formally review all Task Force recommendations and the staff's evaluation and recommended prioritization of the Task Force recommendations.
  - Within 18 months, the staff will submit a notation vote paper to the Commission outlining a regulatory framework for adequate protection that appropriately balances defense-in-depth and risk considerations.

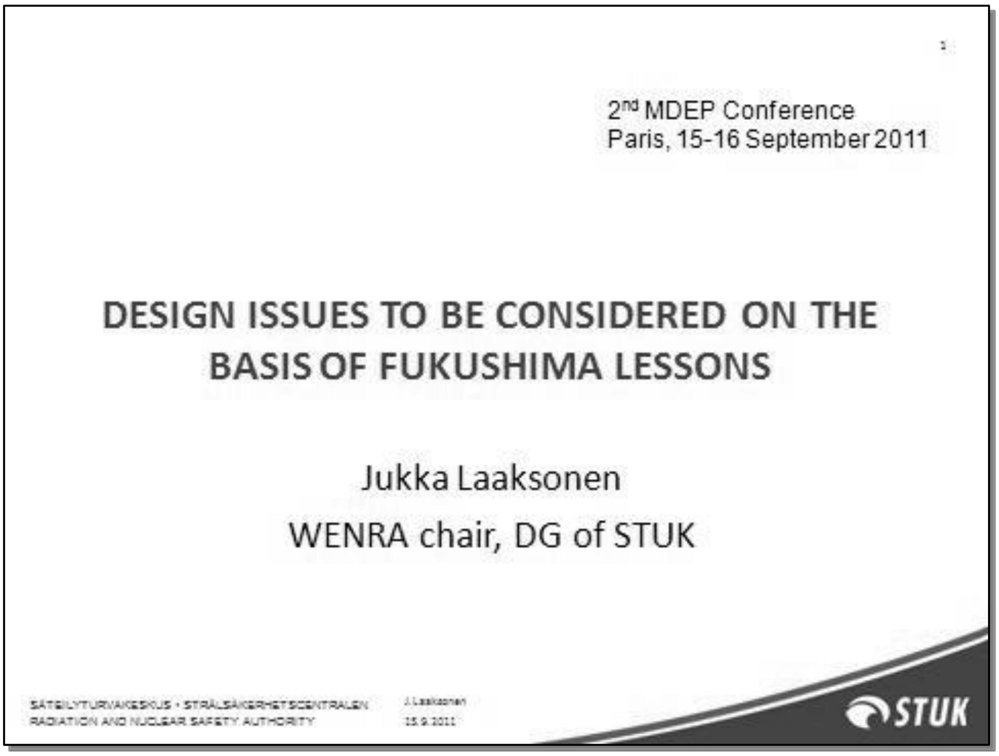
Future Impact of MDEP

U.S.NRC
United States Nuclear Regulatory Commission
Protecting People and the Environment

- The NRC is contemplating regulatory changes.
- MDEP is a venue to share and discuss insights and actions contemplated by national authorities.
- In the end, even if regulatory authorities decide on different responsive measures, we will all benefit from our work in MDEP and other venues by hearing other perspectives on the issues that are raised.

Western European Nuclear Regulators' Association (WENRA)

Jukka Laaksonen, Finland PG Member, Director-General, STUK




Need for design improvements in GEN III reactors?
• The current safety standards written for Gen III reactors, such as
– IAEA NS-R-1 *Safety of Nuclear Power Plants: Design*, as approved by the IAEA Commission of Safety Standards in May 2011, and
– WENRA *Statement on safety objectives for new nuclear power plants*, issued in November 2010,
seem to be valid and do not need changes.
• Nevertheless, their application in a more strict manner and interpretation as concerns safety margins needs to be reconsidered:
– accounting site specific features and hazards
– protecting from/avoiding common cause failures
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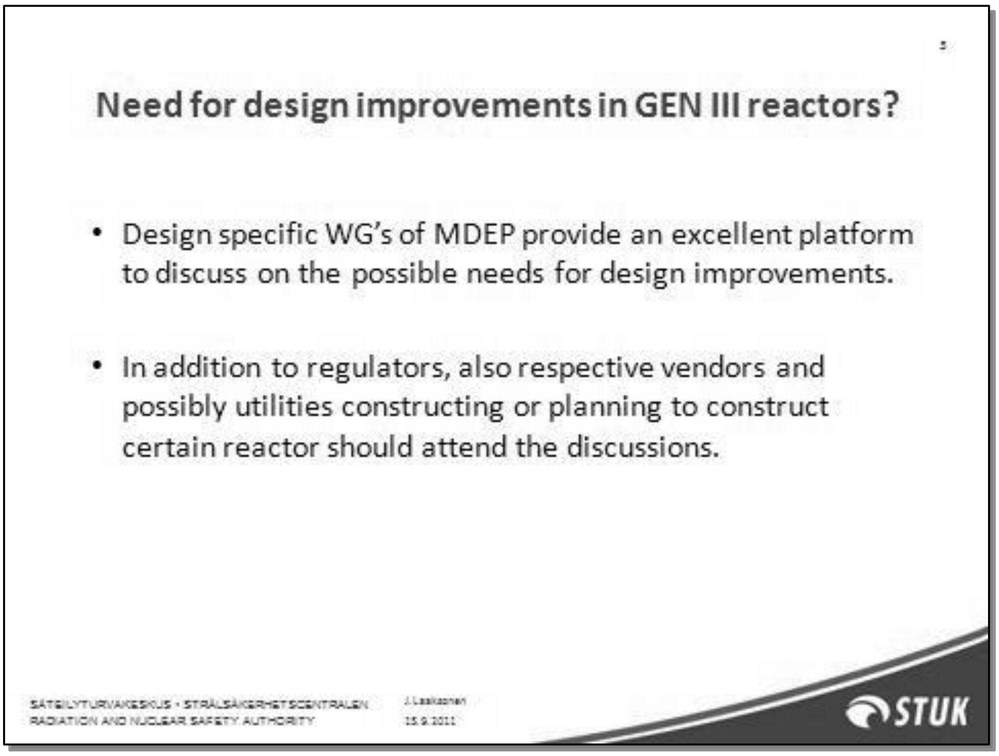
RADIATION AND NUCLEAR SAFETY AUTHORITY
J.Laaksonen
15.9.2011
STUK


Need for design improvements in GEN III reactors?
• Design specific WG's of MDEP provide an excellent platform to discuss on the possible needs for design improvements.
• In addition to regulators, also respective vendors and possibly utilities constructing or planning to construct certain reactor should attend the discussions.
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15.9.2011
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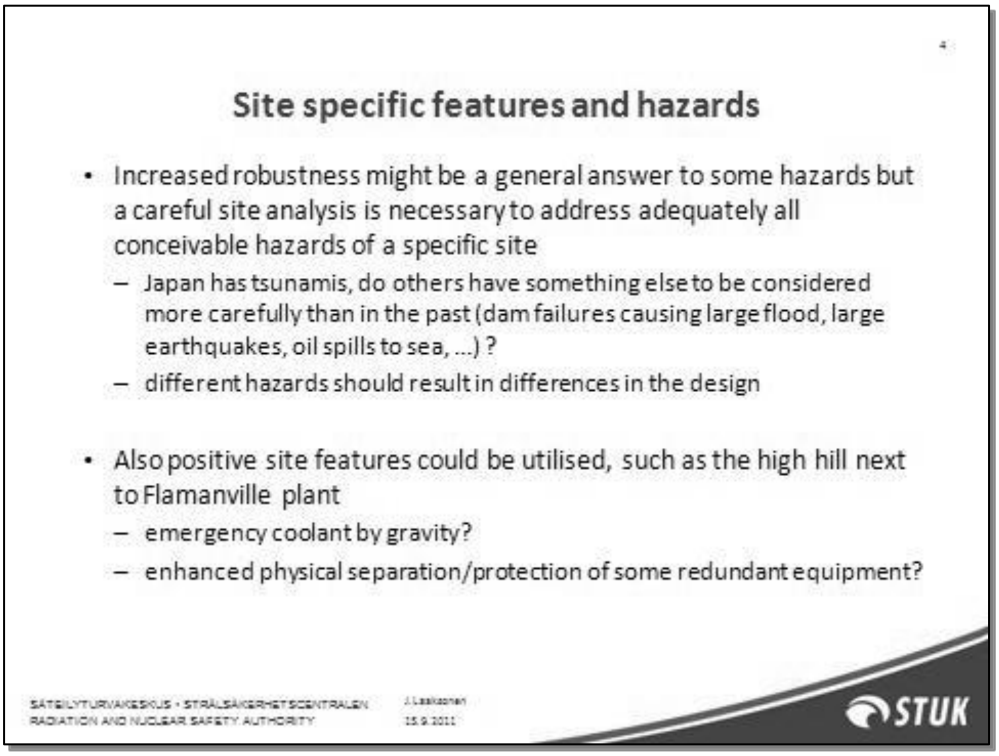
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Site specific features and hazards
• Increased robustness might be a general answer to some hazards but a careful site analysis is necessary to address adequately all conceivable hazards of a specific site
– Japan has tsunamis, do others have something else to be considered more carefully than in the past (dam failures causing large flood, large earthquakes, oil spills to sea, ...) ?
– different hazards should result in differences in the design
• Also positive site features could be utilised, such as the high hill next to Flamanville plant
– emergency coolant by gravity?
– enhanced physical separation/protection of some redundant equipment?
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RADIATION AND NUCLEAR SAFETY AUTHORITY
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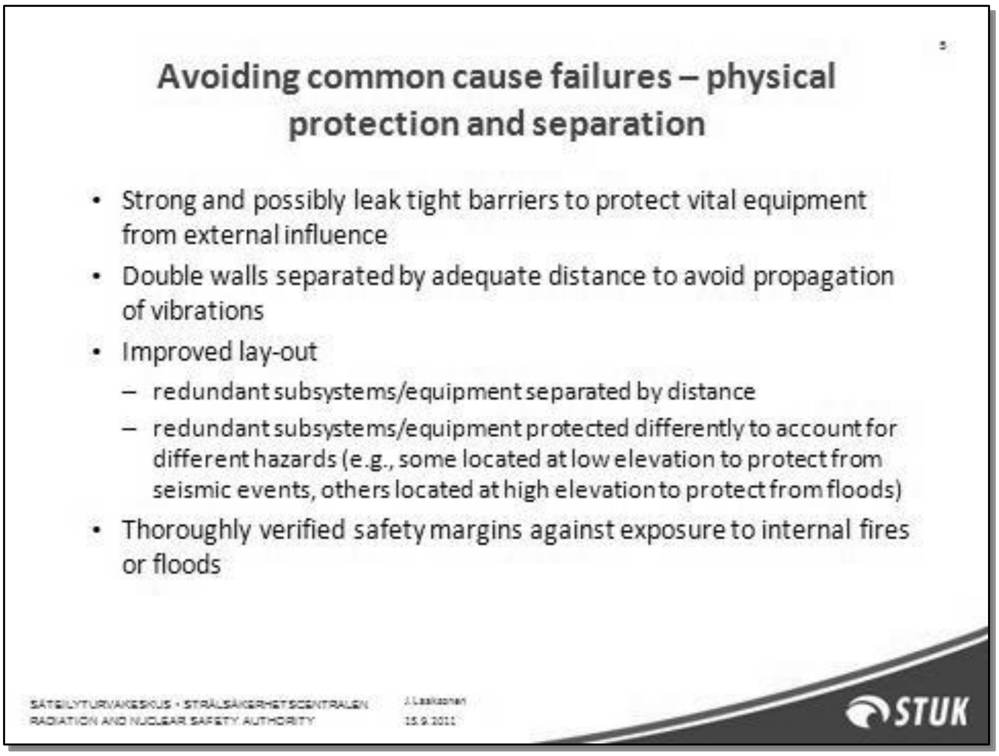
STUK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Avoiding common cause failures – physical protection and separation
• Strong and possibly leak tight barriers to protect vital equipment from external influence
• Double walls separated by adequate distance to avoid propagation of vibrations
• Improved lay-out
– redundant subsystems/equipment separated by distance
– redundant subsystems/equipment protected differently to account for different hazards (e.g., some located at low elevation to protect from seismic events, others located at high elevation to protect from floods)
• Thoroughly verified safety margins against exposure to internal fires or floods
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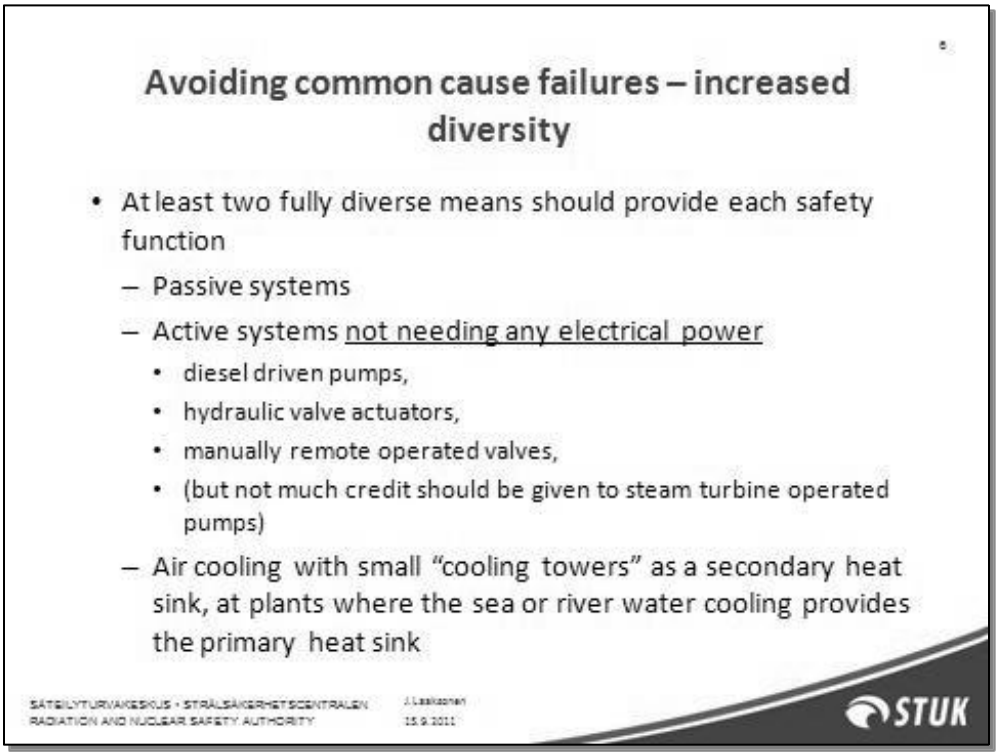
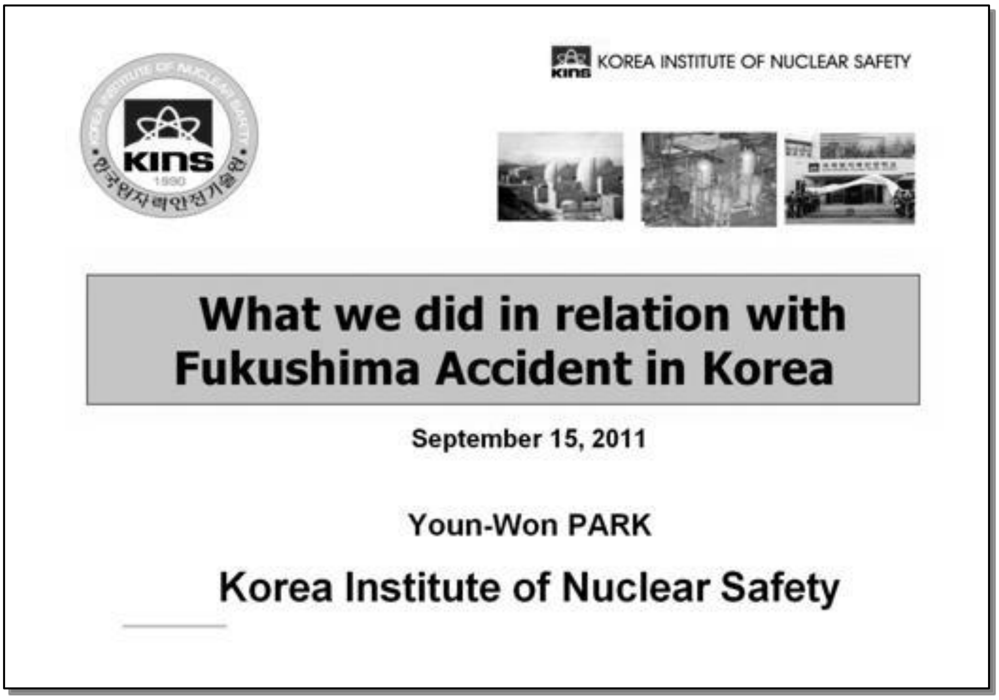
STUK


Avoiding common cause failures – increased diversity
• At least two fully diverse means should provide each safety function
– Passive systems
– Active systems not needing any electrical power
• diesel driven pumps,
• hydraulic valve actuators,
• manually remote operated valves,
• (but not much credit should be given to steam turbine operated pumps)
– Air cooling with small "cooling towers" as a secondary heat sink, at plants where the sea or river water cooling provides the primary heat sink
SÄTEILYTURVAKESKUS • STRÅLSÄKERHETSCENTRALEN
RADIATION AND NUCLEAR SAFETY AUTHORITY
J. Laaksonen
15.9.2011
STUK


Protecting from common cause failures – transportable equipment for safety functions
• Incorporation of easily accessible (also in accident conditions) hook-ups for connection of transportable equipment
– Clean water to primary and secondary circuit, to the containment and to the spent fuel pools
– Borated water as needed to ensure sub-criticality
– Electrical power of various voltage levels and currencies
– Electrical power for charging batteries
– Robust instruments for use in harsh operating conditions
• Several alternative and optimally selected connection points to plant systems should be available
• Well protected storage for transportable equipment and vehicles
SÄTEILYTURVAKESKUS • STRÅLSÄKERHETSCENTRALEN
RADIATION AND NUCLEAR SAFETY AUTHORITY
J. Laaksonen
15.9.2011
STUK

Korea Institute of Nuclear Safety (KINS)

Youn-Won Park, Korea PG representative,
Director of International Nuclear Safety, KINS



CONTENTS

I. How to respond to Fukushima Accident

- Activation of Emergency Response Team
- Crisis communication with public
- Strengthening Environmental Radiation Monitoring and public release
- Special Safety Inspection on Nuclear Facilities

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Special Inspection

❑ Special Safety Inspection by RB

- Special safety inspection was performed to 21 operating NPPs and 1 research reactor.
- Unlikely worst case scenario was considered including
  - *Extreme natural disaster (earthquake + tsunami)*
  - *Loss of off-site power and failure of emergency DGs (SBO)*
  - *Severe accident*

❑ Objective of special safety inspection

- how well the NPPs are designed against natural disasters;
- how well they can mitigate the severe accident;
- how much effective the emergency response system are in place.

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Special Inspection

❑ Conclusion of Special Inspection

- No NPP is exposed to imminent risk
- But safety measures are needed against potential risk

❑ Based on Defense-in-Depth, safety improvement action items were identified.

- 1st Barrier against extreme natural disaster
  - *Improve seismic resistance*
  - *Minimize potential risk of flooding*
- 2nd Barrier to ensure core cooling capability
  - *Make available A/C power at any anticipated events*
  - *Make available cooling water and path at any unlikely event*
- 3rd Barrier to ensure C/B integrity and to improve Emergency response Capability
  - *To eliminate the likelihood of severe accident and avoid hydrogen explosion*
  - *To address multi-unit disaster*

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II. Actions Taken in the light of International Recommendations

- Draft IAEA Action Plan on Nuclear Safety
  - MS to undertake an assessment of NPPs against natural hazards
  - ☞ Special Inspection and Safety Assessment
  - MS to host IAEA peer review service
  - MS to conduct review on emergency response capabilities
  - MS to conduct review on regulatory effectiveness
  - ☞ IRRS Mission to Korea : First IRRS Mission after Fukushima

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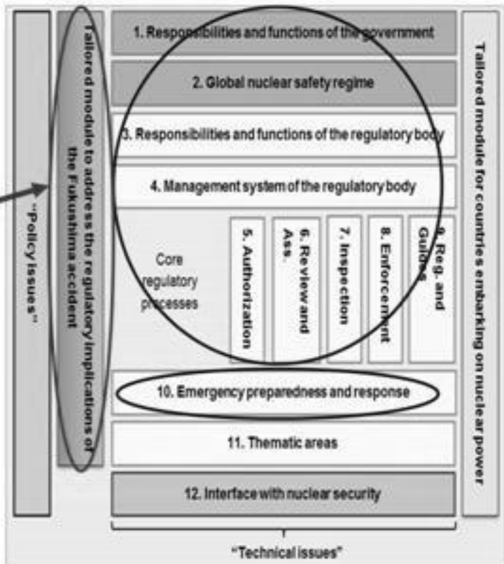
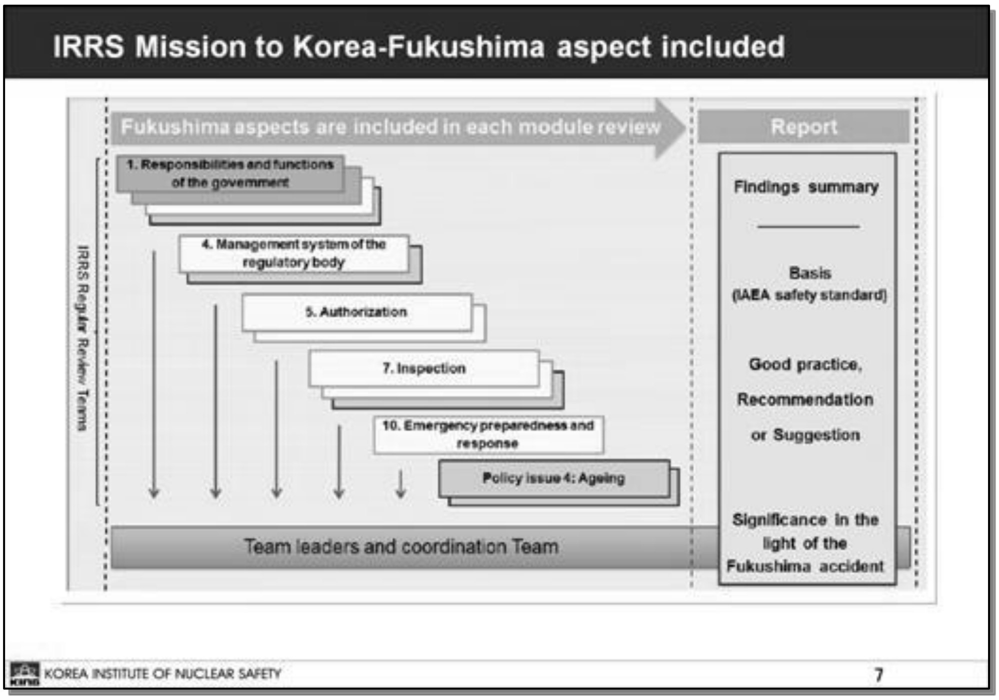
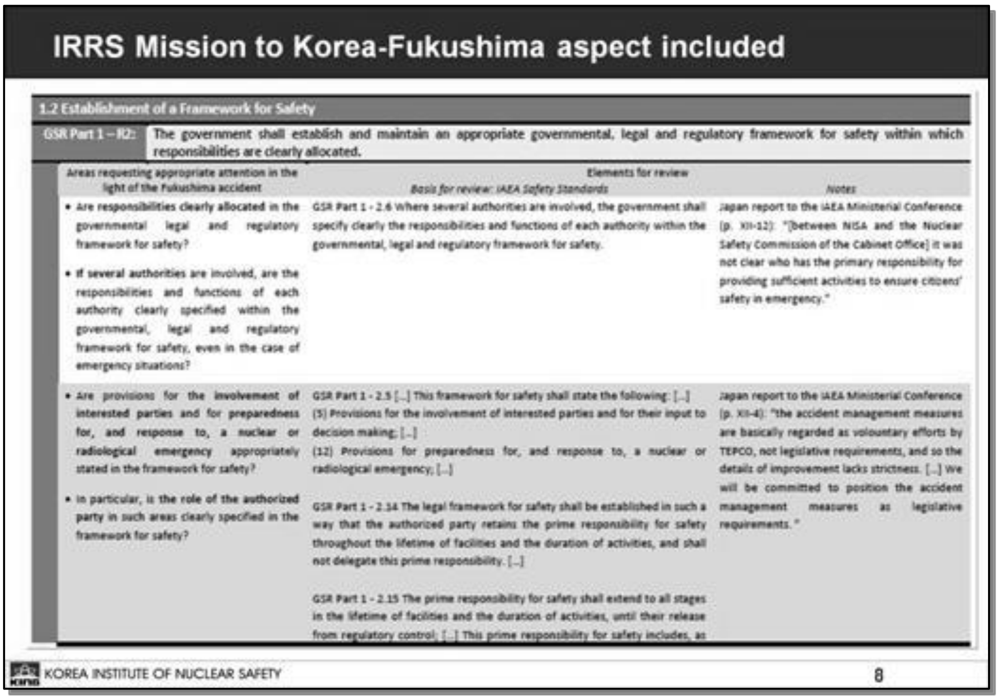
IRRS Mission to Korea

- Nuclear power Plants, Research Reactors, Emergency preparedness
- Module 1 ~ 10
- 5 Policy issues
  - **Fukushima Issues**
  - Independence
  - Transparency/Openness
  - Long Term Operation
  - Ageing Management
- 2 Thematic areas
  - PSR
  - OEF program



KOREA INSTITUTE OF NUCLEAR SAFETY 6





IRRS Mission to Korea-Fukushima aspect included

1.2 Establishment of a Framework for Safety

GSR Part 1 – R2: The government shall establish and maintain an appropriate governmental, legal and regulatory framework for safety within which responsibilities are clearly allocated.

Areas requesting appropriate attention in the light of the Fukushima accident	Elements for review *Basis for review: IAEA Safety Standards*	*Notes*
• Are responsibilities clearly allocated in the governmental legal and regulatory framework for safety? • If several authorities are involved, are the responsibilities and functions of each authority clearly specified within the governmental, legal and regulatory framework for safety, even in the case of emergency situations?	GSR Part 1 - 2.6 Where several authorities are involved, the government shall specify clearly the responsibilities and functions of each authority within the governmental, legal and regulatory framework for safety.	Japan report to the IAEA Ministerial Conference (p. XII-12): "[between NISA and the Nuclear Safety Commission of the Cabinet Office] it was not clear who has the primary responsibility for providing sufficient activities to ensure citizens' safety in emergency."
• Are provisions for the involvement of interested parties and for preparedness for, and response to, a nuclear or radiological emergency appropriately stated in the framework for safety? • In particular, is the role of the authorized party in such areas clearly specified in the framework for safety?	GSR Part 1 - 2.5 [...] This framework for safety shall state the following: [...] (5) Provisions for the involvement of interested parties and for their input to decision making; [...] (12) Provisions for preparedness for, and response to, a nuclear or radiological emergency; [...] GSR Part 1 - 2.14 The legal framework for safety shall be established in such a way that the authorized party retains the prime responsibility for safety throughout the lifetime of facilities and the duration of activities, and shall not delegate this prime responsibility. [...] GSR Part 1 - 2.15 The prime responsibility for safety shall extend to all stages in the lifetime of facilities and the duration of activities, until their release from regulatory control; [...] This prime responsibility for safety includes, as	Japan report to the IAEA Ministerial Conference (p. XII-4): "the accident management measures are basically regarded as volountary efforts by TEPCO, not legislative requirements, and so the details of improvement lacks strictness. [...] We will be committed to position the accident management measures as legislative requirements."

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Summary of IRRS Mission to Korea
The Korean government, through the activities of MEST and KINS has implemented a technically capable and effective nuclear safety regulatory program.
Transition to a new regulatory framework has the potential to enhance regulatory independence, expertise and transparency; however implementation details have yet to be finalized.
Suggest valuable advices to enhance the effectiveness of the new Regulatory Organization
Korea's response to the accident at Fukushima has been prompt and effective. Communications with the public, development of actions for improvement and coordination with international stakeholders was of high quality. Further lessons learned should be adequately addressed.
15 good practices, 12 suggestions and 10 recommendations
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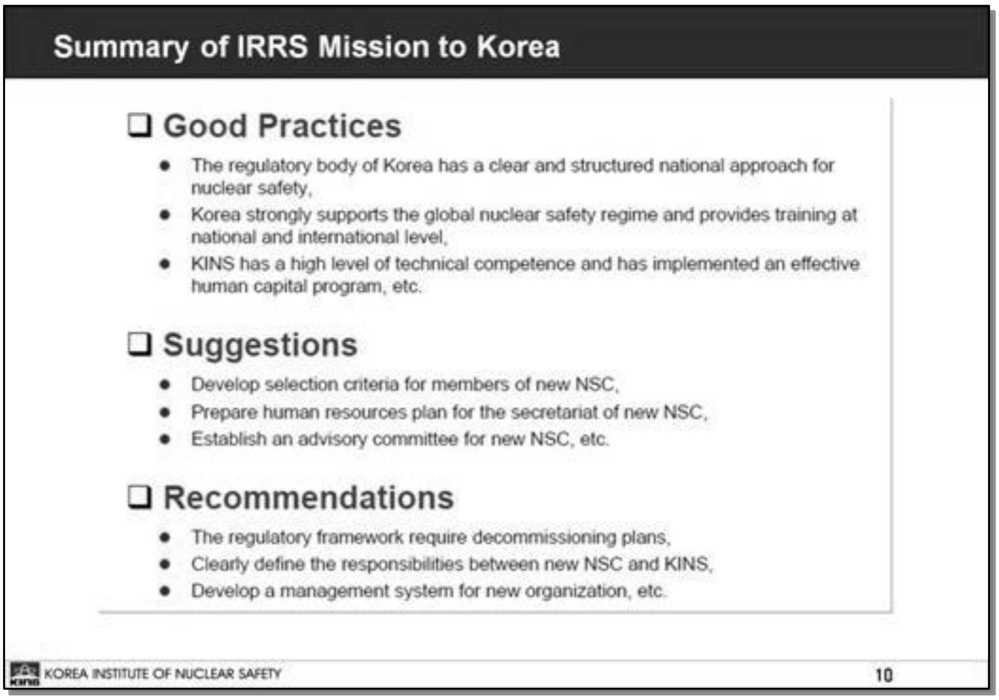
Summary of IRRS Mission to Korea
Good Practices
The regulatory body of Korea has a clear and structured national approach for nuclear safety,
Korea strongly supports the global nuclear safety regime and provides training at national and international level,
KINS has a high level of technical competence and has implemented an effective human capital program, etc.
Suggestions
Develop selection criteria for members of new NSC,
Prepare human resources plan for the secretariat of new NSC,
Establish an advisory committee for new NSC, etc.
Recommendations
The regulatory framework require decommissioning plans,
Clearly define the responsibilities between new NSC and KINS,
Develop a management system for new organization, etc.
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III. Implementation Plan for Nuclear Safety

- Safety Measures for Nuclear Power Plants
  - Short term
    - *Identification of Action Items to address Fukushima Accident through special inspection*
  - Mid term
    - *Evaluation on the Action Items*
    - *Implementation Plan for Identified Action Items*
    - *Harmonization with International Safety Standards and Practices*
  - Long term
    - *Rulemaking taking into account DECs*
- Nuclear Regulatory Framework
  - Establishment of Nuclear Safety and Security Commission

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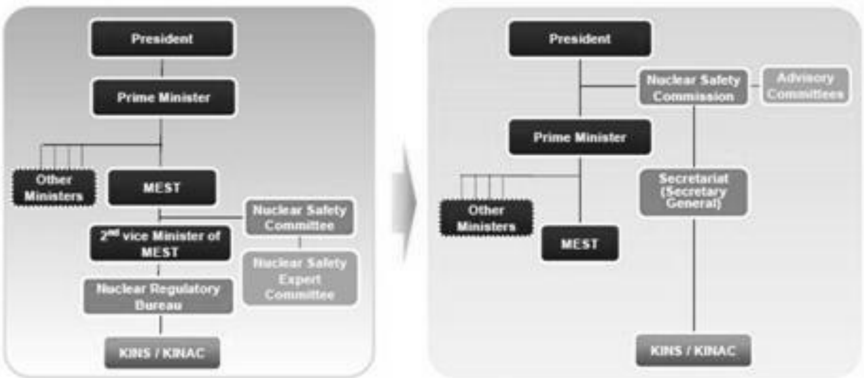
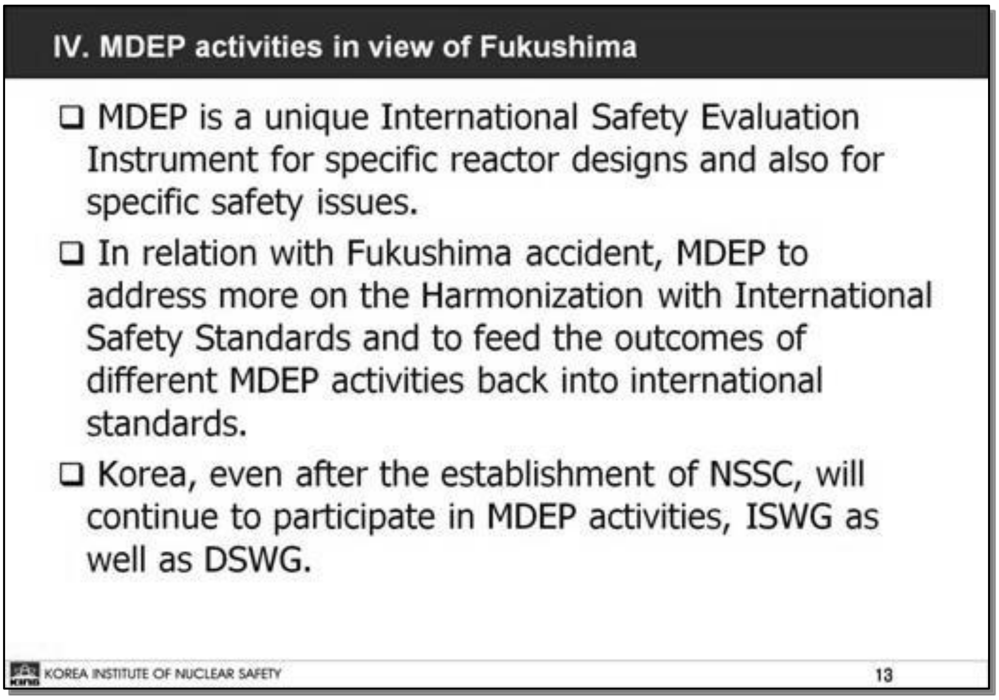
Change of Nuclear Regulatory Framework



- Nuclear Safety Commission (NSC) under President, as standalone regulatory authority
- KINS/KINAC remain as regulatory expert organizations, now to support the NSC
- MEST's role to be restricted to promoting the utilization of nuclear energy

12


IV. MDEP activities in view of Fukushima
❑ MDEP is a unique International Safety Evaluation Instrument for specific reactor designs and also for specific safety issues.
❑ In relation with Fukushima accident, MDEP to address more on the Harmonization with International Safety Standards and to feed the outcomes of different MDEP activities back into international standards.
❑ Korea, even after the establishment of NSSC, will continue to participate in MDEP activities, ISWG as well as DSWG.
KOREA INSTITUTE OF NUCLEAR SAFETY
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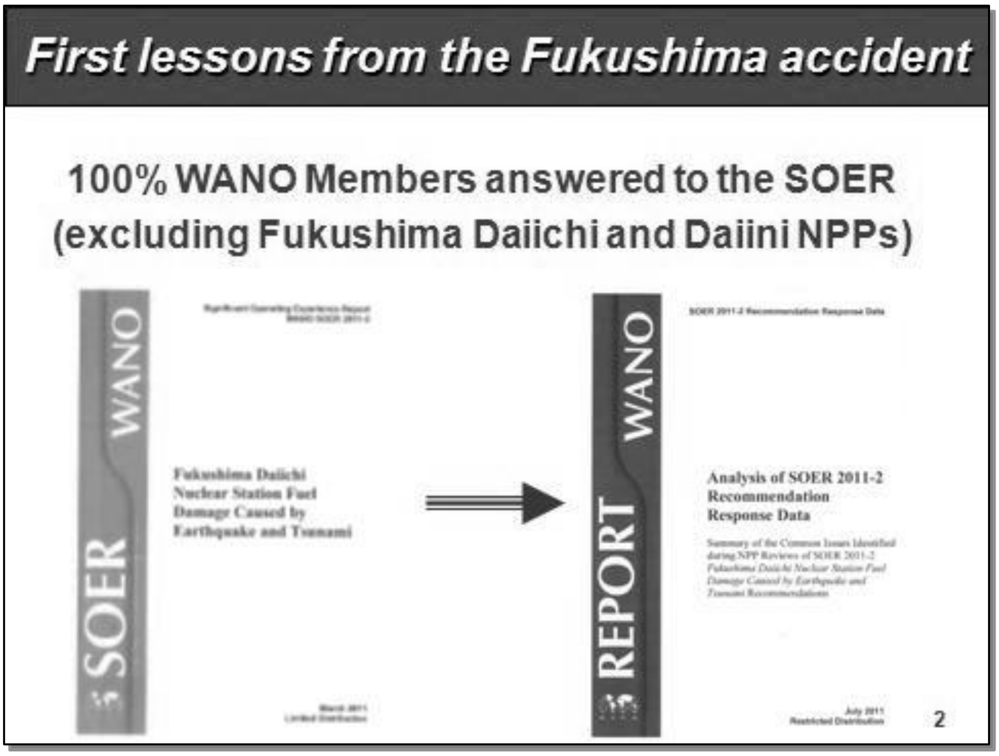
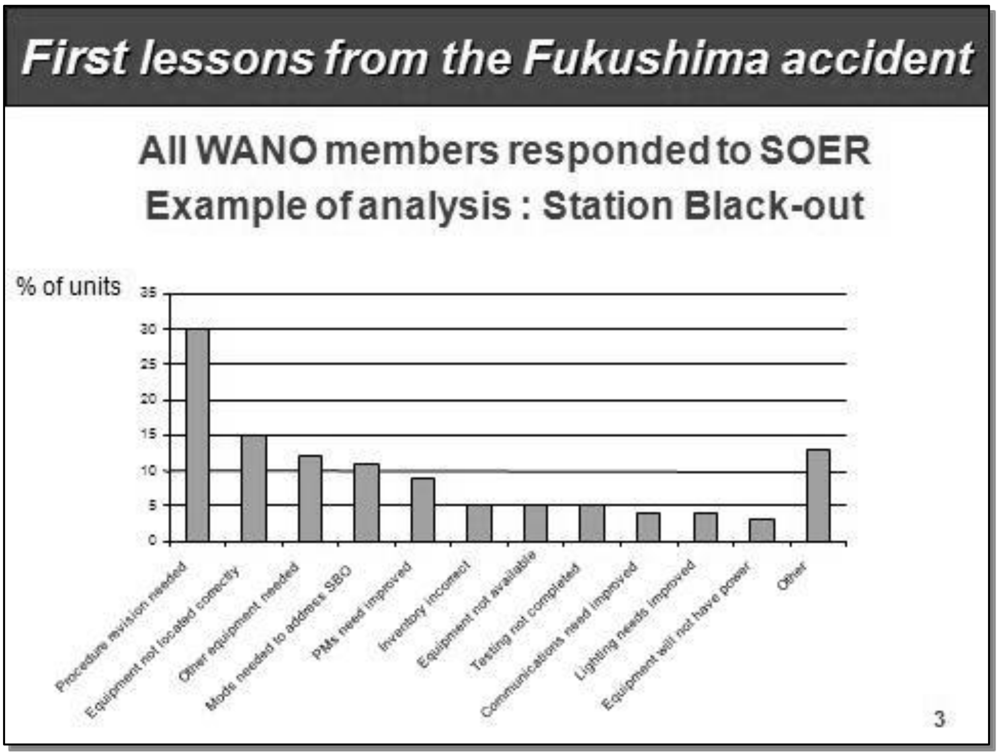
World Association of Nuclear Operators (WANO)

Laurent Stricker, Chair, WANO


First lessons from the Fukushima accident
100% WANO Members answered to the SOER
(excluding Fukushima Daiichi and Daiini NPPs)
SOER
WANO
Fukushima Daiichi
Nuclear Station Fuel
Damage Caused by
Earthquake and Tsunami
REPORT
WANO
Analysis of SOER 2011-2
Recommendation
Response Data
2


First lessons from the Fukushima accident
All WANO members responded to SOER
Example of analysis : Station Black-out
% of units
35
30
25
20
15
10
5
0
Procedure revision needed
Equipment not located correctly
Other equipment needed
Mods needed to address SBO
PMs need improved
Inventory incorrect
Equipment not available
Testing not completed
Communications need improved
Lighting needs improved
Equipment will not have power
Other
3

WANO's Commission to propose improvements

As a result of Fukushima :

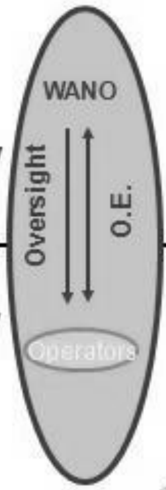
- **Close the SOER gaps in emergency preparedness of each utility :**
  - **Procedures**
  - **Equipment availability**
  - **Drills & training**
- **Better define WANO's roles & responsibilities of WANO & WANO members in an emergency :**
  - **Reinforce the Emergency Team**
  - **Inventory of available equipment from other members**
  - **Coordination with IAEA and other organisations**

4

Nuclear Safety Responsibility

INTERNATIONAL LEVEL : **Collective Responsibility**

NATIONAL LEVEL : **Individual Responsibility**

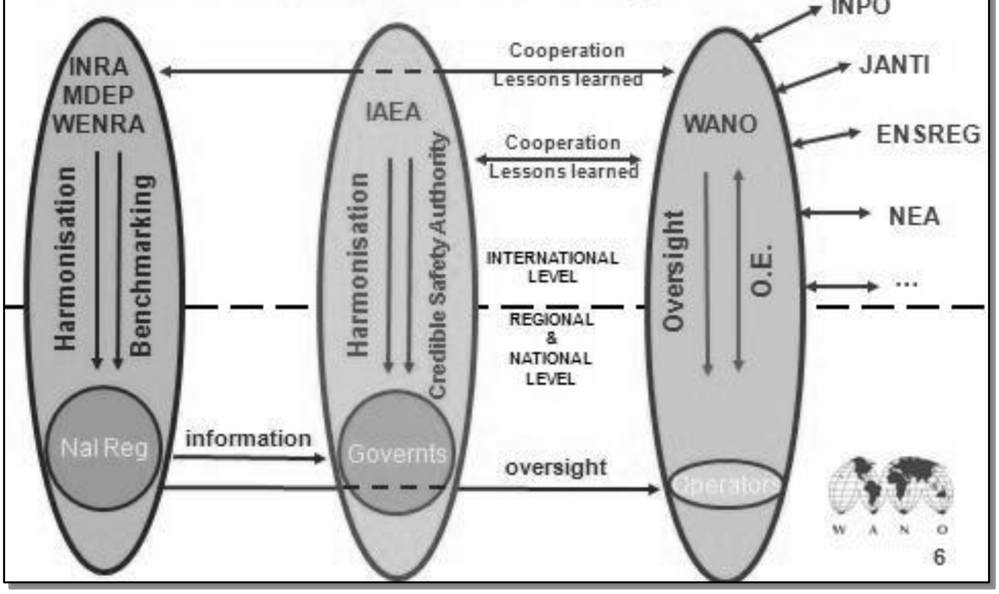


W A N O

5

WANO's Commission to propose improvements

- Coordination with IAEA and other organisations :



WANO improvements

- WANO will, with its members fully committed, continue to prevent TMI & Chernobyl types Accidents by focusing PRs on Nuclear Safety Fundamentals, including :
  - Compulsory high quality "AFIs"
  - Check SOER recommendations' implementation
- Improve Operating Experience, sharing between operators :
  - Better define when a station must report
  - Timely report event
  - Implement SOER recommendations
- Define what is expected of WANO members & the follow-up on members that are not fully participating

7


World Association of Nuclear Operators
Thank you
W A N O
http://www.wano.info

SESSION 6

MDEP ACTIVITIES AND ACCOMPLISHMENTS OF THE VENDOR INSPECTION CO-OPERATION WORKING GROUP (VICWG)

SESSION 6 SUMMARY

Terry Jamieson, Canadian Policy Group member chaired this session. The following persons made remarks and/or gave presentations on the Fukushima related issues:

- Sungho Yang, Korea Institute of Nuclear Safety (KINS), chair of the VICWG, gave a presentation on the status of the VICWG;
- Tsuyoshi Nakamura, General manager of nuclear energy department, Japan Steel Works, Ltd., gave a presentation on JSW and its experience in manufacturing components;
- Sukkwan Kim, Vice-President, NPP quality control, Doosan Heavy Industries and Construction, provided a presentation on Doosan and its experience in vendor inspections;
- Sébastien Crombez, France STC member, ASN, made some remarks on vendor inspection activities in the context of both VICWG and French regulation;
- Yury Meltsov, FSUE VO "Safety", Russia STC representative, VICWG member, gave a presentation on the Russian process of vendors inspections.

The chair of the VICWG presented the status of the VICWG, detailing the near term goals, identifying similarities and differences in the use of quality assurance standards in regulatory inspections, and the long term goal of carrying out multinational inspections of vendors. He also highlighted the experience gained through the 30 witnessed inspections conducted since 2008, procedures for sharing inspection results, inspection protocol, and the comparison of quality assurance regulatory requirements.

After a presentation of JSW's manufacturing experience, the JSW representative expanded to the use of codes and standards: different codes apply regarding the reactor design and the country (ASME for the AP1000 and RCC-M for the EPR for example). On top of that, specific country requirements also must be taken into account. Interest of JSW was expressed for harmonisation of codes and standards for equipment manufacturing and manufacturer qualification.

Doosan's manufacturing experience was developed by the Korean representative, mentioning the 11 on-going projects, mainly AP1000 in the USA and China. Then were highlighted inspections aiming at verifying the implementation of vendor's quality assurance programme by KINS, the US NRC, NNSA and FANR, concluding that the criteria were quite similar as based on ASME and NQA-1. Further expectations regarding MDEP are that inspections are conducted by multiple regulators or that regulators rely on others' inspections to fulfil their respective programme, so as to optimise resources.

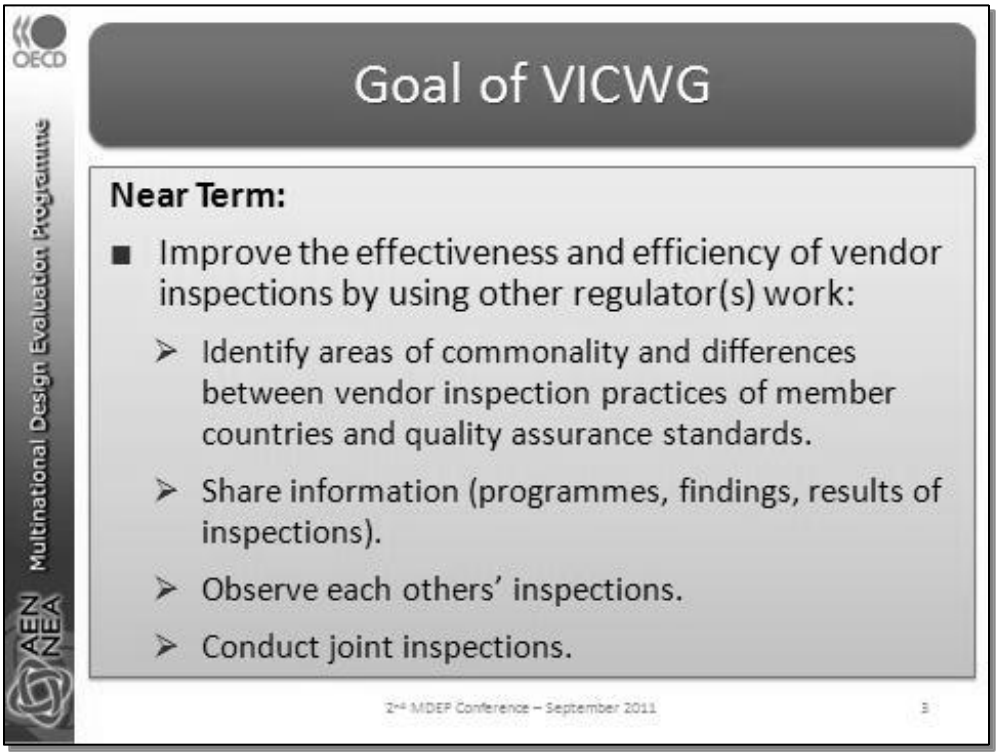
According to the presentation by Mr. Yury Meltsov, inspections are conducted in Russia to assess the organisation and the quality assurance of the manufacturer. When assessing a foreign vendor, implementation of international and national standards will be examined and compared to the Russian standards. Gathering information about foreign vendors, regarding a minimal list of pre-determined tests, would enable the sharing of information between countries on the assessment of vendors, as well as easier co-operation.

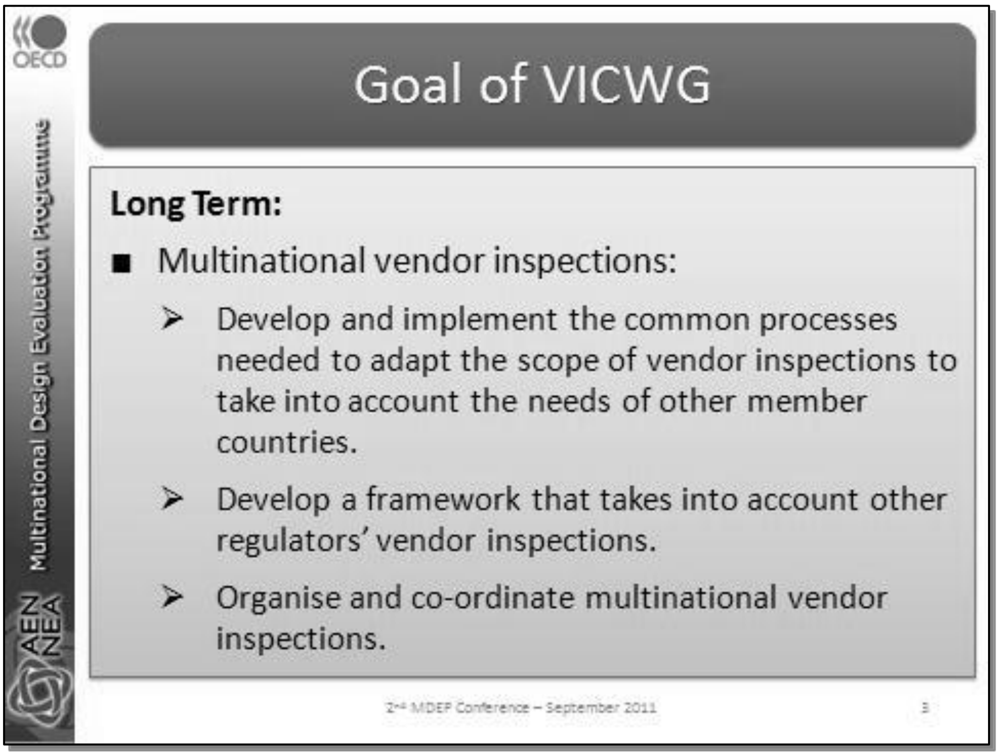
Some members of industry suggested that MDEP inspections should include co-operation on inspection of civil works and other issues so that the regulators could co-operate in such areas.

The MDEP VICWG will likely invite the relevant quality assurance/management standards development organisations (ASME, AFCEN, IAEA, ISO) to a subsequent meeting to discuss ideas of potential harmonisation on QA/QM requirements.

Vendor Inspection Co-operation Working Group

Sungho Yang, Chair of VICWG, KINS


OECD
Multinational Design Evaluation Programme
AEN NEA
Goal of VICWG
Near Term:
Improve the effectiveness and efficiency of vendor inspections by using other regulator(s) work:
Identify areas of commonality and differences between vendor inspection practices of member countries and quality assurance standards.
Share information (programmes, findings, results of inspections).
Observe each others' inspections.
Conduct joint inspections.
2nd MDEP Conference – September 2011
3


OECD
Multinational Design Evaluation Programme
AEN NEA
Goal of VICWG
Long Term:
Multinational vendor inspections:
Develop and implement the common processes needed to adapt the scope of vendor inspections to take into account the needs of other member countries.
Develop a framework that takes into account other regulators' vendor inspections.
Organise and co-ordinate multinational vendor inspections.
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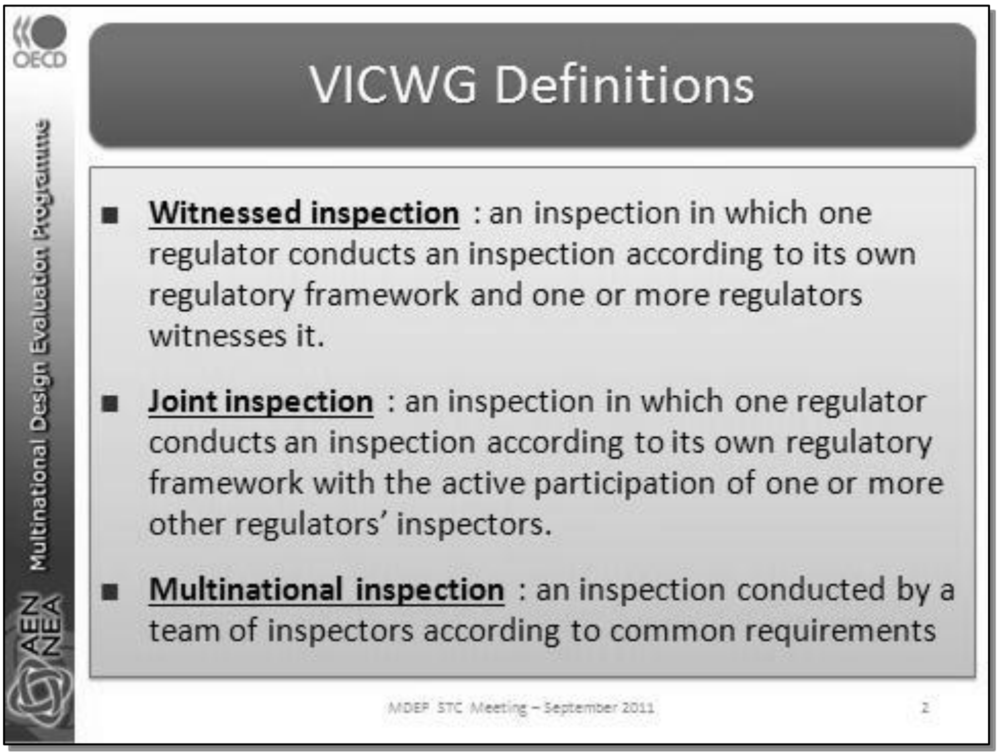
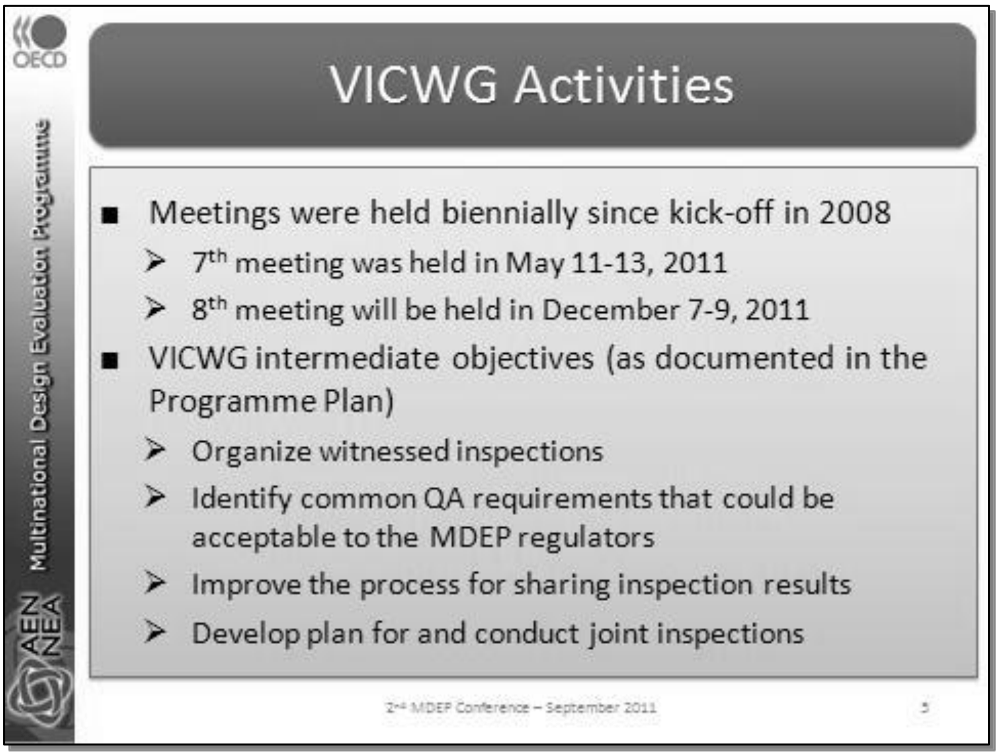
3


OECD
Multinational Design Evaluation Programme
AEN NEA
VICWG Definitions
Witnessed inspection : an inspection in which one regulator conducts an inspection according to its own regulatory framework and one or more regulators witnesses it.
Joint inspection : an inspection in which one regulator conducts an inspection according to its own regulatory framework with the active participation of one or more other regulators' inspectors.
Multinational inspection : an inspection conducted by a team of inspectors according to common requirements
MDEP STC Meeting – September 2011
2


OECD
Multinational Design Evaluation Programme
AEN NEA
VICWG Activities
Meetings were held biennially since kick-off in 2008
7th meeting was held in May 11-13, 2011
8th meeting will be held in December 7-9, 2011
VICWG intermediate objectives (as documented in the Programme Plan)
Organize witnessed inspections
Identify common QA requirements that could be acceptable to the MDEP regulators
Improve the process for sharing inspection results
Develop plan for and conduct joint inspections
2nd MDEP Conference – September 2011
3


OECD
Multinational Design Evaluation Programme
AEN NEA
Organize Witnessed Inspections
Inspection cooperation up to 2011
Conducted over 30 VICWG inspections (witnessed and joint) since 2008
One joint inspection to address an emerging issue and support licensing decision for OL3 (conducted in 2010)
Major vendors activities (design, fabrication and quality assurance) were inspected
Vendor inspections have extended to Digital I&C vendors
5 more inspections scheduled through the end of 2011
One of these is a joint inspection of Doosan in October 2011
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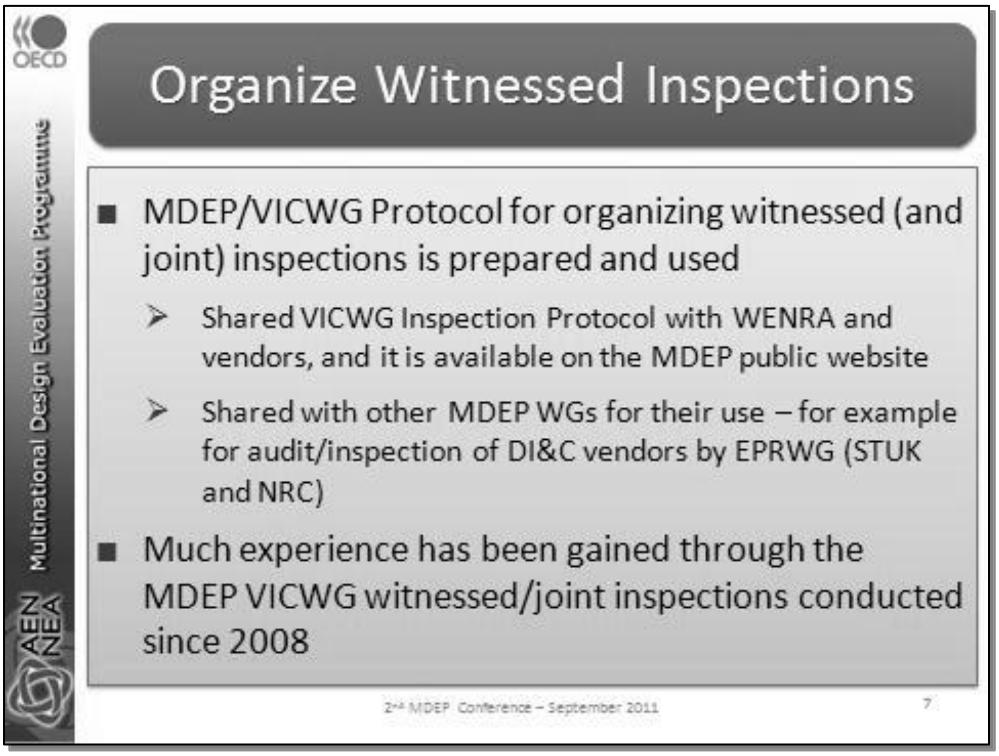
OECD
Multinational Design Evaluation Programme
AEN NEA
Organize Witnessed Inspections
MDEP/VICWG Protocol for organizing witnessed (and joint) inspections is prepared and used
Shared VICWG Inspection Protocol with WENRA and vendors, and it is available on the MDEP public website
Shared with other MDEP WGs for their use – for example for audit/inspection of DI&C vendors by EPRWG (STUK and NRC)
Much experience has been gained through the MDEP VICWG witnessed/joint inspections conducted since 2008
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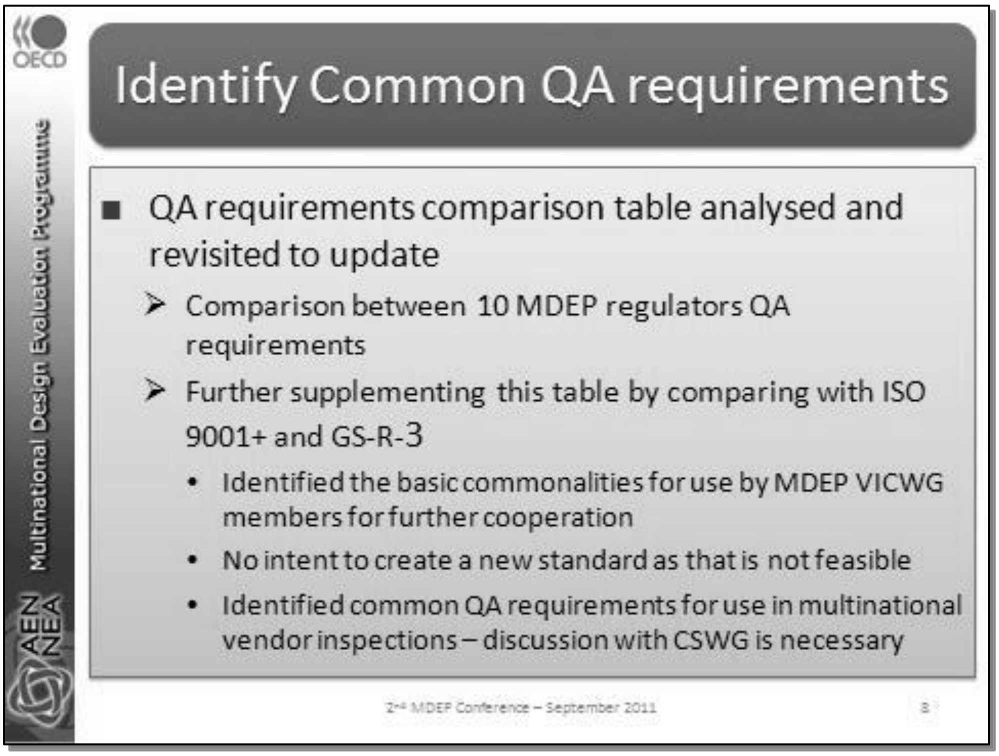
OECD
Multinational Design Evaluation Programme
AEN NEA
Identify Common QA requirements
QA requirements comparison table analysed and revisited to update
Comparison between 10 MDEP regulators QA requirements
Further supplementing this table by comparing with ISO 9001+ and GS-R-3
Identified the basic commonalities for use by MDEP VICWG members for further cooperation
No intent to create a new standard as that is not feasible
Identified common QA requirements for use in multinational vendor inspections – discussion with CSWG is necessary
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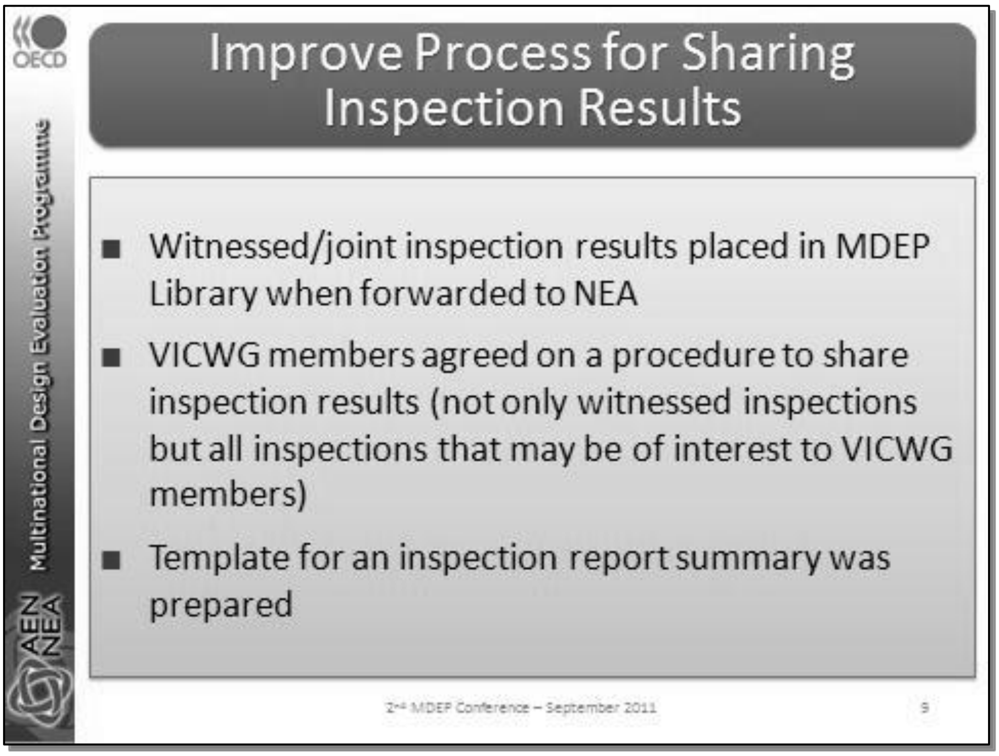
OECD
Multinational Design Evaluation Programme
AEN NEA
Improve Process for Sharing Inspection Results
Witnessed/joint inspection results placed in MDEP Library when forwarded to NEA
VICWG members agreed on a procedure to share inspection results (not only witnessed inspections but all inspections that may be of interest to VICWG members)
Template for an inspection report summary was prepared
2nd MDEP Conference – September 2011
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OECD
Multinational Design Evaluation Programme
AEN NEA
Develop Plan for and Conduct Joint Inspections
The protocol for conducting joint inspections has been finalized and implementation is explored
ASN and STUK carried out a joint inspection in March 2010 (ONR and NRC witnessed)
Joint inspection planned for 2011
KINS inspection of Doosan (October) with active participation of NRC inspectors. NISA and JNES to witness the inspection.
2nd MDEP Conference – September 2011
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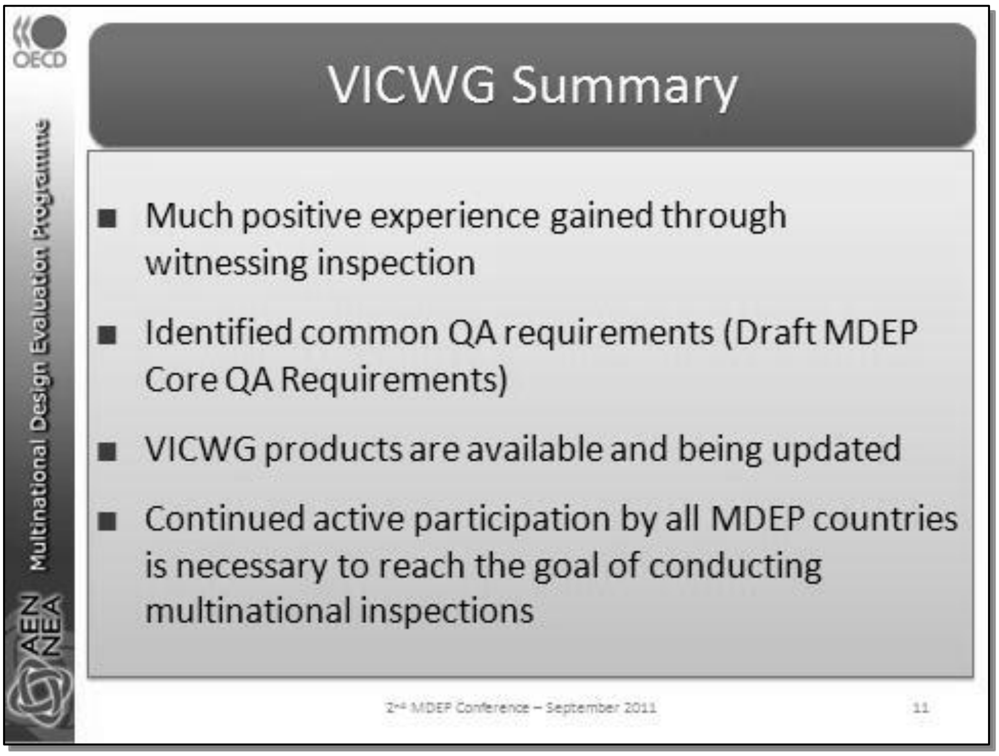
OECD
Multinational Design Evaluation Programme
AEN NEA
VICWG Summary
Much positive experience gained through witnessing inspection
Identified common QA requirements (Draft MDEP Core QA Requirements)
VICWG products are available and being updated
Continued active participation by all MDEP countries is necessary to reach the goal of conducting multinational inspections
2nd MDEP Conference – September 2011
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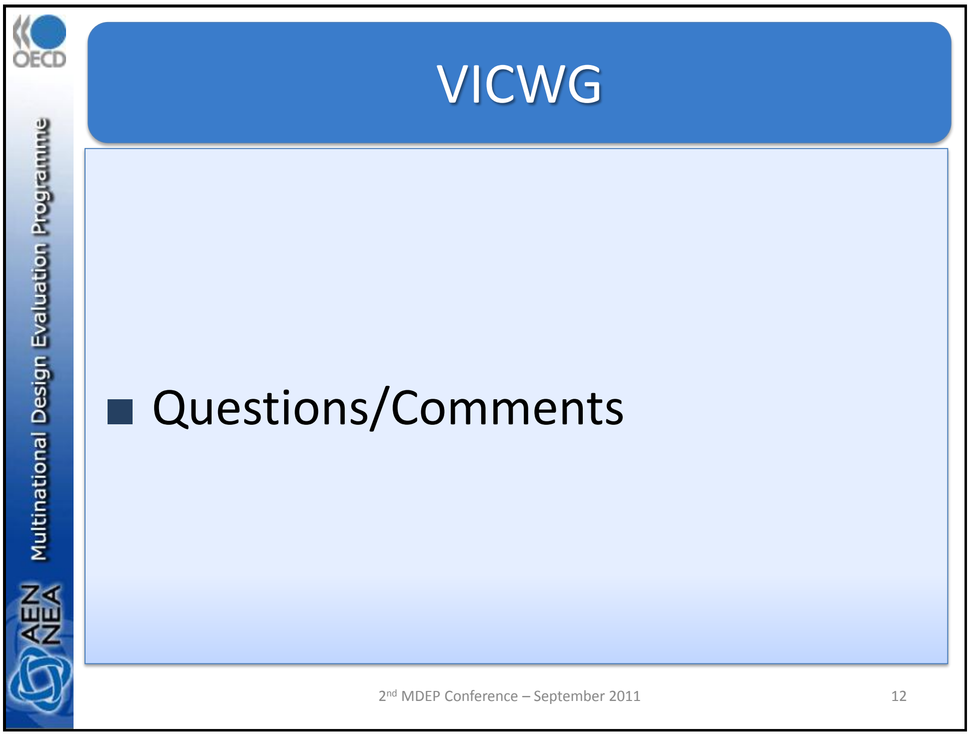
OECD
Multinational Design Evaluation Programme
AEN NEA
VICWG
Questions/Comments
2nd MDEP Conference – September 2011
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Vendor Inspection Co-operation Working Group

Yury Meltsov, Executive Director, FSUE VO "Safety"

CONTENT

1. Arrangement of qualification inspection system for vendors of products for Russian NPPs

•Construction of NPP abroad

•Vendors selection process

•Competitive selection process

2. Inspections objectives

3. Inspection results

4. Assessment of foreign suppliers

5. Accomplishing the above objectives with provide for:

6. Conclusion

Arrangement of qualification inspection system for vendors of products for Russian NPPs

Rostechnadzor

(Government Authority for Regulation of nuclear and radiation safety in nuclear field)

- development of safety Codes and Standards, granting licenses to enterprises designing and manufacturing NPP equipment
- Conduct of inspections to check compliance with licenses conditions and requirements of safety Codes and Standards
- FSUE VO "Safety" - routine random inspection of quality in the process of equipment manufacture

State Corporation Rosatom

(Management of atomic energy)

Tendering for NPP equipment supply in accordance with the Unified Industry Procurement Standard, preliminary selection of vendors

Construction of NPP abroad

Rostechnadzor - assisting in safety regulation

- Scientific and Engineering Center for Nuclear and Radiation Safety (SEC NRS) - assisting in development of regulatory documents
- FSUE VO "Safety" - services for assessment of vendors and manufactured equipment quality

Prime contractor of NPP construction abroad is authorized by the State Corporation Rosatom to carry out activities on NPP design, erection and commissioning, as well preliminary inspection of vendors and tendering for NPP equipment supply.

Process of vendors selection

Inspections conducted at the licensing stage, tendering procedures and inspections in the process of production often have different scope of activities (depending on assigned tasks and enterprise experience in nuclear field) and under different programs not fully coordinated among one another (at different stages of selection process).

Specifically programs of Russian and foreign vendors selection may differ because different assessment criteria related to specific production and technology may be used in assessment thereof.

Approaches to assessment of Russian and foreign vendors differ in principle.

Competitive selection process

State Corporation Rosatom system

The following shall be done in accordance with the Unified Industry Procurement Standard:

• Tendering for NPP equipment supply as per established procedures and criteria

• Preliminary assessment and inspection (if necessary) of vendors, **rather than subsuppliers and co-performers.**

• Keeping register of dishonest vendors (Law FZ-94)

Basic criteria of equipment supply application assessment

•Contract price and time of delivery

•Product quality and functions characteristics

•Participants qualification

•Participants technical capabilities

•Availability of personnel

•Availability of Rostechnadzor license for a respective kind of activity

•Participant's experience and reputation

Inspection objectives

1. Establishing technical and organizational capability of an enterprise to carry out activities in nuclear field (preliminary inspection)

Development of enterprise's passport (certificate) or a similar document

2. Checking production preparedness in concluding a specific delivery agreement. Establishing co-performers and subcontractors. Assessment of enterprise Quality System and its preparedness to start work

Availability of real conditions to fulfill an order (prior inspection of equipment compliance). Availability of vendors register.

3. Random inspection of the current enterprise system of launching production of equipment (to be delivered) in the course of conformity assessment

Spot tests of product with the aim to confirm its quality

Inspection can be conducted under a special program with account of enterprise specific features and with participation of a specialized organization and representatives of other countries' regulators

Revealing deficiencies in product control system, quality management system, documentation and personnel qualification. Development of inspection methodical procedure

Results of inspections

The following shall be done as a result of inspections:

1. Obtain and analyse information with the aim to develop a conceptual document (approach) to assessment of vendors using working groups for processing and analysis of obtained information. Analysis criteria shall be formulated and means to improve inspections procedures shall be established in the document

2. Set up a graded approach to inspection programs of the enterprises:

- having working experience in the field of nuclear power

- not having claims to the quality of previously manufactured product

- have not manufactured products for NPP before

- having capabilities to fully satisfy customers requirements

Assessment of foreign vendors

While evaluating foreign vendors and inspecting their preparedness to launch manufacture we check the matters of compliance of Customers' regulatory documents requirements with the requirements of national and international standards.

In Russia vendor's capabilities are assessed in accordance with the requirements of Rostechnadzor document RD-03-36-2002 "Terms and conditions of delivery of imported equipment, products, materials, and component parts for nuclear facilities, radiation sources, and storage sites of the Russian Federation", and namely:

• Comparison is done of the Russian Federation documents requirements with the requirement of national and international documents used by a vendor
• Methods and procedures of items quality control are compared with the requirements of respective Russian documents
• Analysis of delivery contracts contents is made.

Accomplishment of the above objectives will:

1. Provide for a unified approach and criteria of assessment of vendors of products for NPP

2. Define a minimal list of tests (acceptance, qualification, etc.) for a particular product

3. Establish optimal time frame and frequency of inspections and define a graded approach to inspections conduct and content

4. Make it possible to create an accessible information data base of vendors (on international and bilateral basis)

5. Enable involvement of other countries organizations, WG participants in vendors assessment

Conclusion

At present the current Russian system of product vendors selection provides for control of supply of high quality and reliable equipment for NPPs

At the same time there are some problems in selection and evaluation of vendors manufacturing metallurgical products and component items not only for nuclear branch, but for other industries

Besides, due to the absence of complete information, the process of selection and assessment of foreign vendors is complicated

Availability of common approaches and vendor assessment criteria, as well as unified information data base on European vendors may considerably improve the quality of their selection and increase the efficiency of satisfaction of quality requirements to products for NPPs.

Japan Steel Works, Ltd.

Tsuyoshi Nakamura, General Manager of Nuclear Energy Dept., JSW

OECD/NEA/2nd MDEP Conference

Differences on Requirements for Manufacturing of Forgings

Sept. 16, 2011

Tsuyoshi Nakamura

General Manager of Nuclear Energy Dept.

THE JAPAN STEEL WORKS, LTD.

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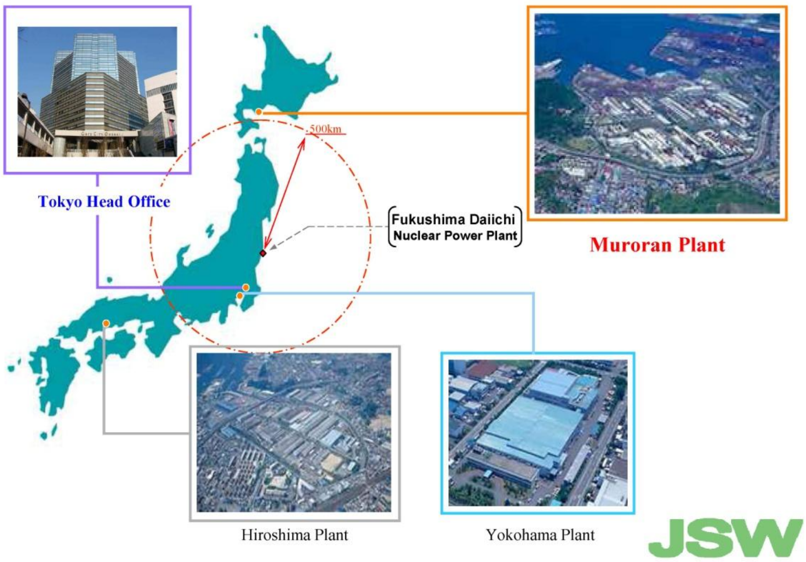
JSW

Contents

1. Introduction of JSW Muroran Plant
2. Manufacturing Experience of Nuclear Forgings
3. Main Applicable Codes for Forgings
4. Vender Inspection
5. Expectation to MDEP's Activities

2

1. Introduction of JSW Muroran Plant



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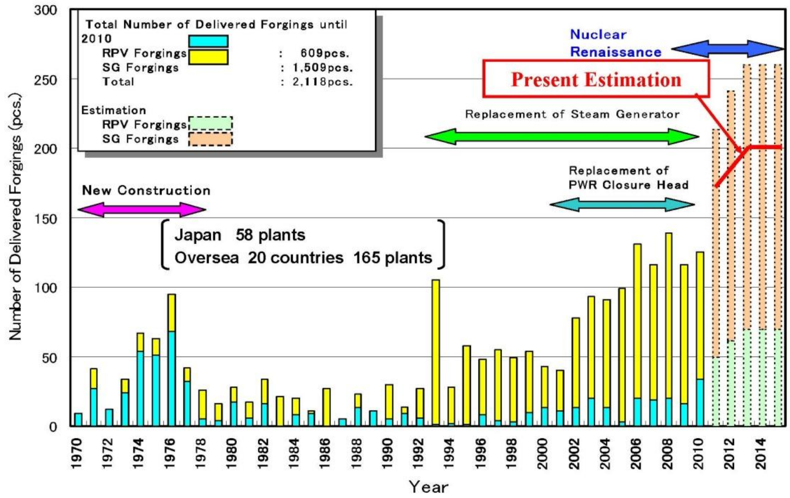
2. Manufacturing Experience of Forgings for RPV & SG



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JSW

2.1 Manufacturing Experience of Forgings for EPR

Nozzle Shell Flange

Primary Head

Component	No.	Project / Product	#1 Olkiluoto –3	#2 Flamanville –3	#3 Taishan –1	#4 Taishan –2	#5 USA	#6 TBD	#7 Penly –3	#8 UK
RPV	1	Closure Head	●	–	–	–	–	*	–	–
	2	Head Flange	●	●	●	–	–	*	*	*
	3	Nozzle Shell Flange	●	●	●	●	●	●	○	*
	4	Upper Core Shell	●	●	●	–	–	*	*	*
	5	Lower Core Shell	●	●	●	–	–	*	*	*
	6	Transition Ring	●	●	●	–	–	○	*	*
	7	Bottom Head	●	–	–	–	–	*	–	–
SG	8	Elliptical Head	●	●	●	–	○	–	*	*
	9	Upper Shell	●	–	–	–	–	–	–	–
	10	Nozzle Shell	●	–	–	–	–	–	–	–
	11	Conical Shell	●	●	●	●	●	*	○	*
	12	High Shell	●	–	–	–	–	–	–	–
	13	Intermediate Shell	●	–	–	–	–	–	–	–
	14	Lower Shell	●	–	–	–	–	–	–	–
	15	Tube Sheet	●	●	●	–	●	*	*	*
	16	Primary Head	●	●	●	●	●	*	*	*

● : Forging ○ : Under manufacturing * : Before manufacturing

TBD: To Be Determined

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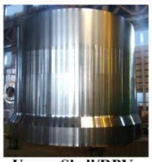
JSW

2.2 Manufacturing Experience of Forgings for AP1000

Closure Head/RPV



Upper Shell/RPV

Channel Head/SG

Upper Head/SG

Component	No.	Project / Product	#1 China	#2 Vogtle −3	#3 TBD	#4 TBD	#5 TBD	#6 Xianning −2	#7 Tao Hua Jiang	#8 San Men	#9 Tao Hua Jiang	#10 Pengze −1	#11 Haiyang
RPV	1	Closure Head	●	●	●	●	*	○	*	*	-	-	-
	2	Upper Shell	●	●	●	●	*	○	*	*	-	-	-
	3	Lower Shell	●	●	●	●	*	○	*	*	-	-	-
	4	Transition Ring	●	●	●	●	*	○	-	-	-	-	-
	5	Lower Head	●	●	●	●	*	○	-	-	-	-	-
SG	6	Upper Head	●	●	●	○	*	○	○	*	*	-	-
	7	Upper Shell E	-	●	●	○	*	*	-	-	-	-	-
	8	Upper Shell D	-	●	●	○	*	*	-	-	-	-	-
	9	Transition Cone	●	●	●	●	*	○	○	*	-	-	-
	10	Lower Shell C	-	●	●	●	*	○	-	-	-	-	-
	11	Lower Shell B	-	●	●	●	*	○	-	-	-	-	-
	12	Lower Shell A	-	●	●	●	*	○	-	-	-	-	-
	13	Tube Sheet	●	●	●	●	○	●	○	*	-	*	*
	14	Channel Head	● (Separate type)	●	●	○	*	○	○	*	○	-	*

● : Forging   ○ : Under manufacturing   * : Before manufacturing

TBD: To Be Determined

6

JSW

3. Main Applicable Codes for Forgings (1/2)

Applicable code is difference for each reactor design and location of site.

	Basic Code		Location of Site
AP1000	: ASME		
ABWR	: JSME, ASME	+	Country's Rules
EPR	: RCCM		

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JSW

3. Main Applicable Codes for Forgings (2/2)

(Example of Country's rule)

AP1000 projects in China

1) Special mechanical properties are required for forgings, additionally.

2) Many production weld test materials are required.

Projects in France

1) Application of ESPN (Order of December 12, 2005 related to Nuclear Pressure Equipments) is required.

Projects in UK

1) Application of ISO17025 (Qualification of Test Laboratory) is required.

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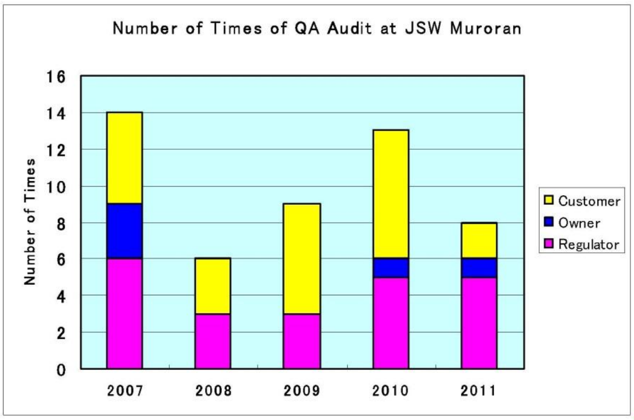
JSW

4. Vender Inspection (1/2)

JSW has many experience to receive vender inspection (quality assurance audit/survey).



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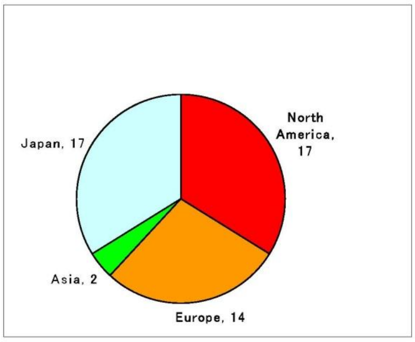
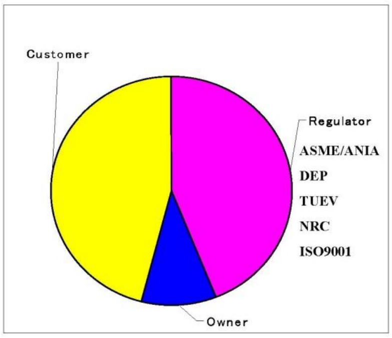
JSW

4. Vender Inspection (2/2)

Number of times of QA audits at JSW Muroran for 2007 to 2011





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5. Expectation to MDEP's Activities

JSW (as material manufacturer) expects to MDEP's activities,

- **To harmonize requirements of Code and Standard for material manufacturing.**
- **To simplify the process of manufacturer qualification.**

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Thank you
for your attention!
The Japan Steel Works, Ltd.
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JSW

Doosan Heavy Industries and Construction

Suk Kwan Kim, Vice-President, NPP Quality Control, Doosan Heavy Industries and Construction

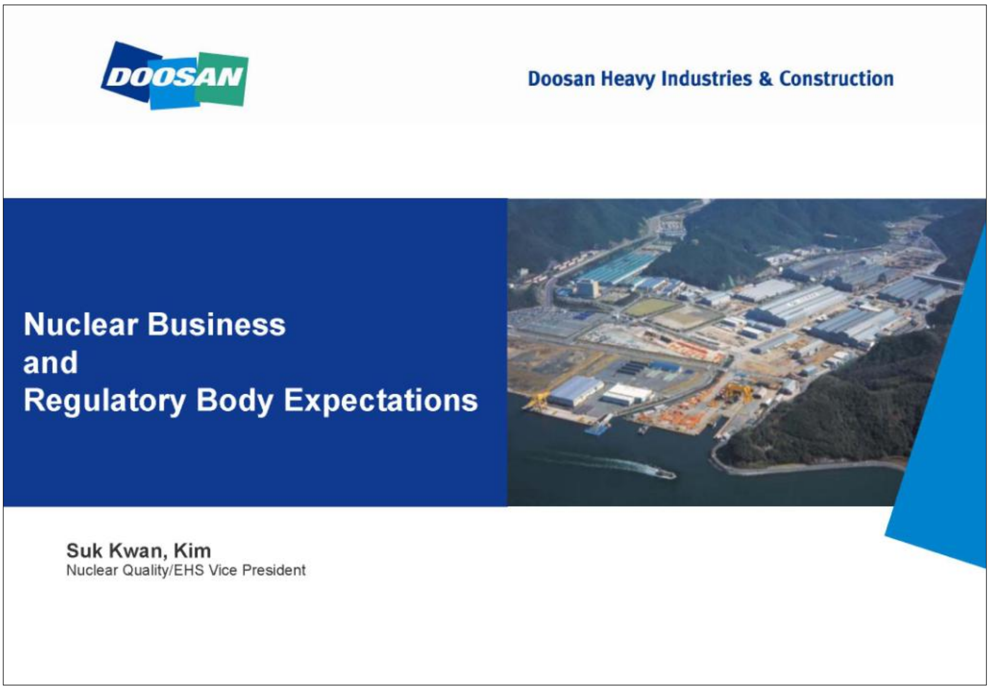

Table of Contents

Company Overview _ Nuclear Business

Material

- Supply forgings which are basic materials for nuclear Power Plant

Fabrication

- Fabricate Various Reactor types: PWR, PHWR, and Replacement Components
- NSSS(Nuclear Steam Supply System), BOP(Balance of Plant), T/G(Turbine/Generator)
  - Reactor Vessel, Steam Generator, RV Internal
- Now, performing localization of I&C major system and RCP for APR1400 Project
  - MMIS(Man Machine Interface System)
  - RCP(Reactor Coolant Pump)

Erection

- Participate in Construction on Domestic Site

Experience _ Domestic

Over 30 years of experience, 25 projects including under construction projects

Completed

Year	Project	Type	Remark
1980~2010	Yonggwang #1,2	PWR	900 Mwe
	Ulchin #1,2	PWR	900 Mwe
	Yonggwang #3,4	PWR	1000 Mwe
	Wolsong #2,3,4	PHWR	1000 Mwe
	Ulchin #3,4	PWR	1000 Mwe
	Yonggwang #5,6	PWR	1000 Mwe
	Ulchin #5,6	PWR	1000 Mwe
	KEDO #1,2	PWR	1000 Mwe
	Shin-Kori #1,2	PWR	1000 Mwe
	Shin-Wolsong #1,2	PWR	1000 Mwe

Under Construction

Year	Project	Type	Remark
2010~	Shin-Kori #3,4	PWR	1400 Mwe (APR1400 : Advanced Power Reactor)
	Shin-Ulchin #1,2	PWR	1400 Mwe (APR1400 : Advanced Power Reactor)

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Experience _ Overseas

12 projects are completed, 11 projects are on-going

Year (supply)	Customer	Project	Scope	Remark
2001	China	Quinshan Phase III #1,2	NSSS	Completed
2002	USA	Sequoyah #1	RSG	Completed
2005	USA	Watts Bar #1	RSG	Completed
2006	USA	ANO #2	RPZR	Completed
2009	USA	ANO #2 / Waterford #3	RRVCH&CEDM	Completed
2018	USA	Indian Point #2,3	RRVCH&CEDM	On-going
2009	China	Qinshan Phase II Unit 3	RV	Completed
2010	USA	Sequoyah Unit 2	RSG	Completed
2006	USA	Palo Verde Unit 1,2,3	RRVCH&CEDM	Completed
2011	China	Sanmen #1	SG,RV	On-going
2011	China	Haiyang #1	SG,RV,RVI	On-going
2020	Japan	TEPCO Cask	Cask	On-going
2014	USA	Vogtle #3,4	SG,RV	On-going
2015	USA	V.C.Summer #2,3	SG,RV	On-going
2018	UAE	*BNPP #1,2	NSSS	On-going

*BNPP(Braka Nuclear Power Plant) is same as Shin-Kori #3.4

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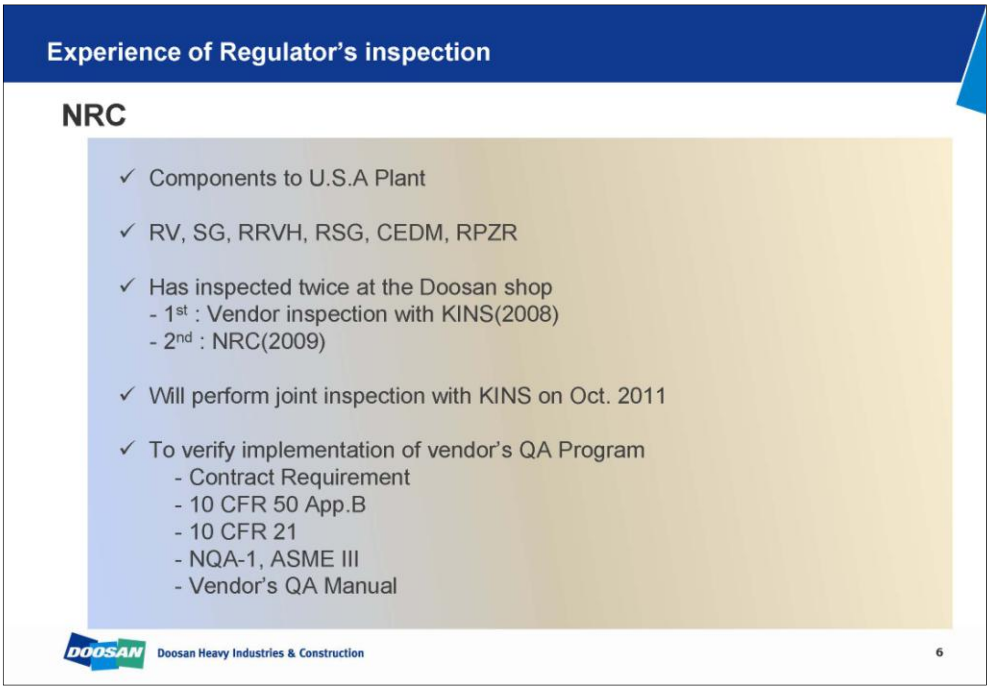
Experience of Regulator's inspection
NRC
✓ Components to U.S.A Plant
✓ RV, SG, RRVH, RSG, CEDM, RPZR
✓ Has inspected twice at the Doosan shop
- 1st : Vendor inspection with KINS(2008)
- 2nd : NRC(2009)
✓ Will perform joint inspection with KINS on Oct. 2011
✓ To verify implementation of vendor's QA Program
- Contract Requirement
- 10 CFR 50 App.B
- 10 CFR 21
- NQA-1, ASME III
- Vendor's QA Manual
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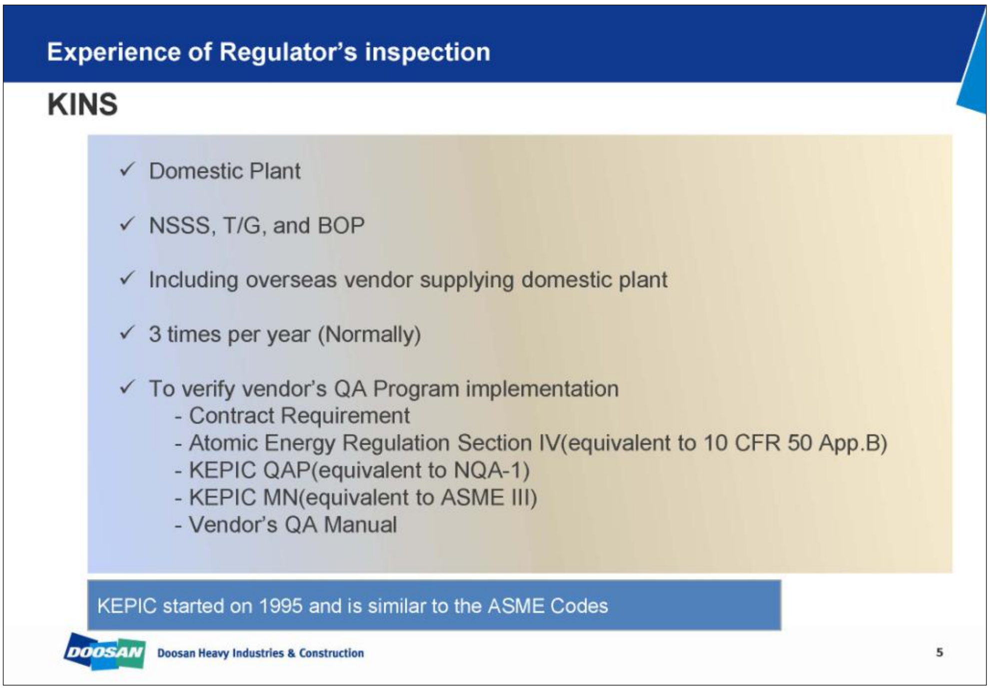
Experience of Regulator's inspection
KINS
✓ Domestic Plant
✓ NSSS, T/G, and BOP
✓ Including overseas vendor supplying domestic plant
✓ 3 times per year (Normally)
✓ To verify vendor's QA Program implementation
- Contract Requirement
- Atomic Energy Regulation Section IV(equivalent to 10 CFR 50 App.B)
- KEPIC QAP(equivalent to NQA-1)
- KEPIC MN(equivalent to ASME III)
- Vendor's QA Manual
KEPIC started on 1995 and is similar to the ASME Codes
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Experience of Regulator's inspection

NRC

- ✓ Components to U.S.A Plant
- ✓ RV, SG, RRVH, RSG, CEDM, RPZR
- ✓ Has inspected twice at the Doosan shop
  - 1st : Vendor inspection with KINS(2008)
  - 2nd : NRC(2009)
- ✓ Will perform joint inspection with KINS on Oct. 2011
- ✓ To verify implementation of vendor's QA Program
  - Contract Requirement
  - 10 CFR 50 App.B
  - 10 CFR 21
  - NQA-1, ASME III
  - Vendor's QA Manual

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Experience of Regulator's inspection

NNSA

- ✓ China Project(Samen, Haiyang)
- ✓ RV, SG, and RVI
- ✓ Has once inspected the Doosan shop on Aug. 2011
- ✓ To verify implementation of vendor's QA Program
  - Contract Requirement
  - 10 CFR 50 App.B
  - NQA-1, ASME III
  - Vendor's QA Manual

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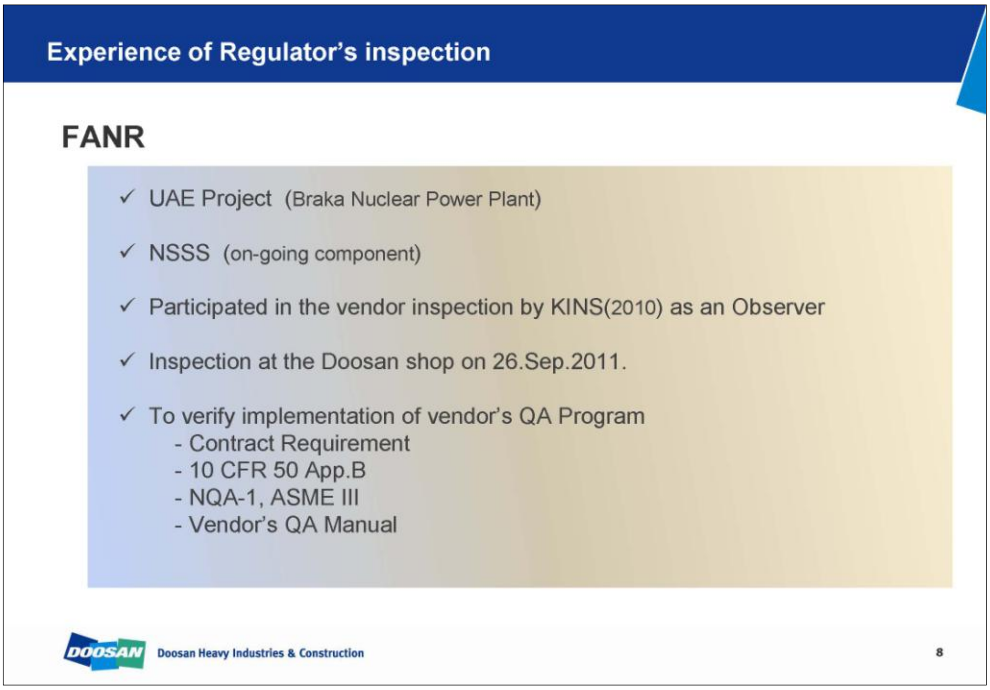
Experience of Regulator's inspection
FANR
✓ UAE Project (Braka Nuclear Power Plant)
✓ NSSS (on-going component)
✓ Participated in the vendor inspection by KINS(2010) as an Observer
✓ Inspection at the Doosan shop on 26.Sep.2011.
✓ To verify implementation of vendor's QA Program
- Contract Requirement
- 10 CFR 50 App.B
- NQA-1, ASME III
- Vendor's QA Manual
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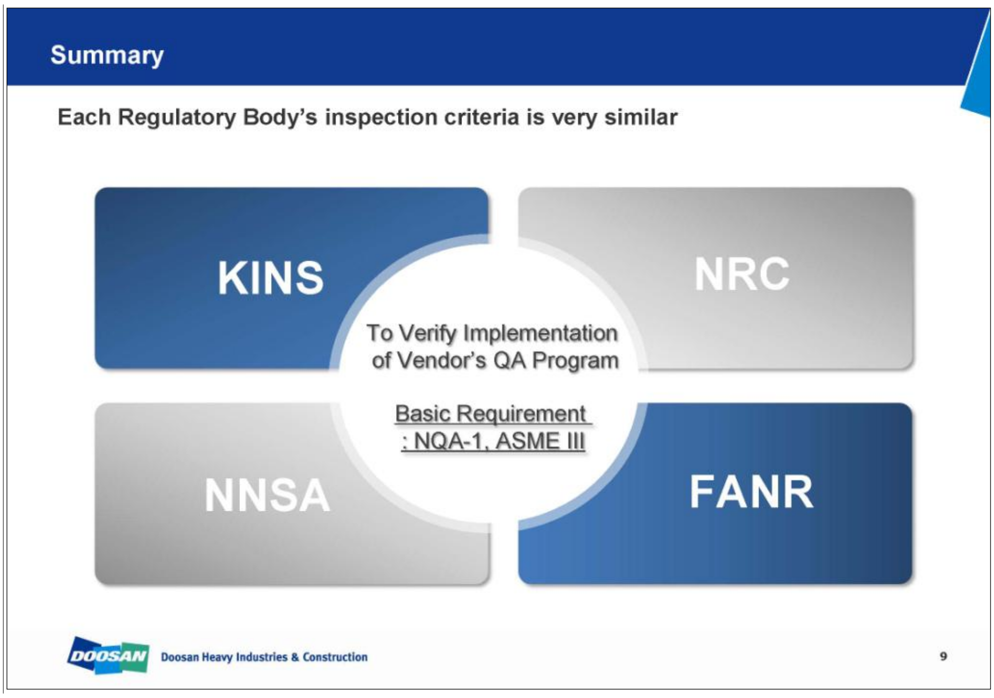
Summary
Each Regulatory Body's inspection criteria is very similar
KINS
NRC
To Verify Implementation of Vendor's QA Program
Basic Requirement : NQA-1, ASME III
NNSA
FANR
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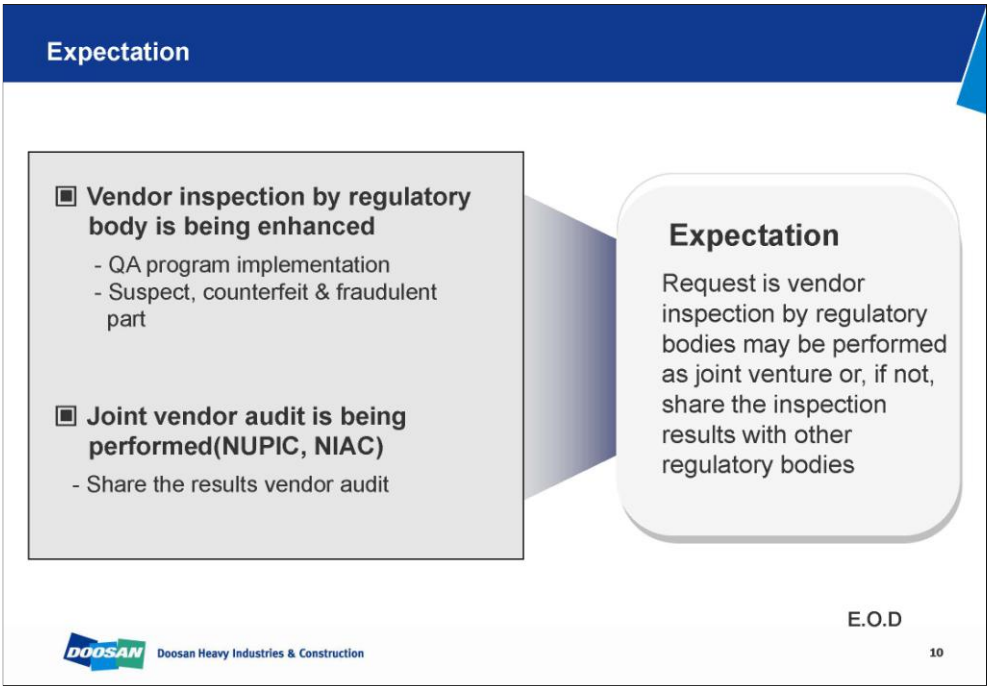
Expectation
▣ Vendor inspection by regulatory body is being enhanced
- QA program implementation
- Suspect, counterfeit & fraudulent part
▣ Joint vendor audit is being performed(NUPIC, NIAC)
- Share the results vendor audit
Expectation
Request is vendor inspection by regulatory bodies may be performed as joint venture or, if not, share the inspection results with other regulatory bodies
E.O.D
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SESSION 7

INDUSTRY INITIATIVES ON NEW REACTOR DESIGNS

SESSION 7 SUMMARY

Michael Micklinghoff, E.on, WNA/CORDEL, led this session. The following persons made remarks and/or gave presentations on the Fukushima related issues:

- Raidis Zemdegs, AECL, CORDEL member for international industry licensing survey, gave a presentation of COREL activities and perspectives;
- Christian Raetzke, co-chair of the WNA task force on licensing and permitting, gave a presentation of the task force;
- Thomas Fröhmel, E.On, representative of the joined Foratom-Eniss and WNA/CORDEL group, gave a presentation of the industry proposals for IAEA safety guide on safety classification of SSCs in NPPs;
- Gary Holahan, US NRC, Deputy Director of the Office of New Reactors, Chair of MDEP STC, gave a presentation of MDEP thoughts on the industry proposal;
- Peter Bester, South Africa national Nuclear Regulator (NNR), STC member, gave a presentation of the benefits for small regulators to have standardisation;
- Marjo Mustonen, TVO, Olkiluoto 3 nuclear safety manager and director of contruction, gave a presentation of ;
- Jerry Head, GE-Hitachi Nuclear Energy, senior vice-president, regulatory affairs;
- Xavier Pouget-Abadie, EDF, senior safety advisor, gave a presentation of EDF perspective on standardisation.

It was announced that Mr. Jerry Head was, just days prior to the conference, chosen as the new chair of WNA CORDEL replacing Mr. Micklinghoff.

One of WNA CORDEL's main goals is to promote standardisation and the working group is divided into several task forces. Through these task forces, interaction with MDEP is sought mainly in areas of codes and standards (to interact with MDEP's CSWG), probabilistic safety goals, licensing and permitting (multinational approach) and design change management (benefits of a standard fleet throughout life cycle of reactors). A survey has been answered by utilities and being used to set up an "effective change management and design authority" in charge of maintaining standard designs in time, spreading best practices and chosen modifications on all of the reactors based on the same design. Future plans for CORDEL are to contribute to MDEP's work on I&C, comment on regulatory views on post-Fukushima actions concerning new builds and review probabilistic methods for demonstrating seismic adequacy.

The second WNA CORDEL presentation focused on the licensing and permitting task force actions, aiming principally at supporting the WNA members when facing licensing of new reactors. The CORDEL survey was detailed. It mainly dealt with the interaction of regulatory processes with the industry's commercial activities such as procurement, contracting and finance. Acknowledging that regulatory practices differ globally, questions were asked about which one were preferred and how they connect with different structures of contracting vendors and manufacturers: multiple steps licensing, pre-licensing based on early design, overall contract approach, long lead items ordering, etc. The survey report is planned to be drafted in April 2012.

Then a presentation was given on the status of the IAEA safety guide on safety classification of structures, systems, and components (SSCs) in nuclear power plants (NPPs) (IAEA Draft safety guide DS 367). The framework, as detailed in the presentation, is set by the IAEA SSR 2/1 which requires the fulfilment of fundamental safety functions, through the action of items important to safety that need to operate under a set of events. All items important to safety shall be identified and classified, according to their safety significance. From the industry point of view, some issues remain in the last drafted document. Agreeing with the overall approach, the industry still suggests that it should not be reactor specific. Besides, the scope of the verification steps should be expanded and the industry proposed a specific approach to deal with operational SSCs that could perform safety functions with the assignment of provisions against failure. To conclude, elaboration of test cases is proposed prior to the IAEA consultancy meeting in November 2011 to stress this very new approach and demonstrate its effectiveness.

The MDEP STC chair presented the participation of MDEP in international harmonisation of practices: CSWG encouragement for the mechanical codes and standards comparison, DICWG's co-operation with IEEE and IEC and involvement of the IAEA. He responded to WNA/CORDEL's proposition by reminding that MDEP members retained the full responsibility of the regulation of their country's nuclear activities and by pointing out that MDEP means to interact with the drafting of the IAEA standard through the country members' participation.

In his presentation, the South Africa representative emphasised that standardisation of reactors and harmonisation of standards would also help small regulators to deal with the review reactor designs, modifications or operation, as they must face the same issues than bigger regulators, but with fewer resources.

TVO's representative presentation started with underlining the benefits of standardised reactors: for safety through a better operating experience and also from an economic point of view with the vendor optimisation through manufacturing of more similar components. This can be achieved only with strong multinational co-operation (regulators and utilities) toward harmonised licensing procedures. TVO pays attention to these efforts in the on-going process of selecting the reactor type for Olkiluoto 4.

The representative of GE-Hitachi gave remarks about the need of a regulatory framework to achieve standardisation of designs for improving safety.

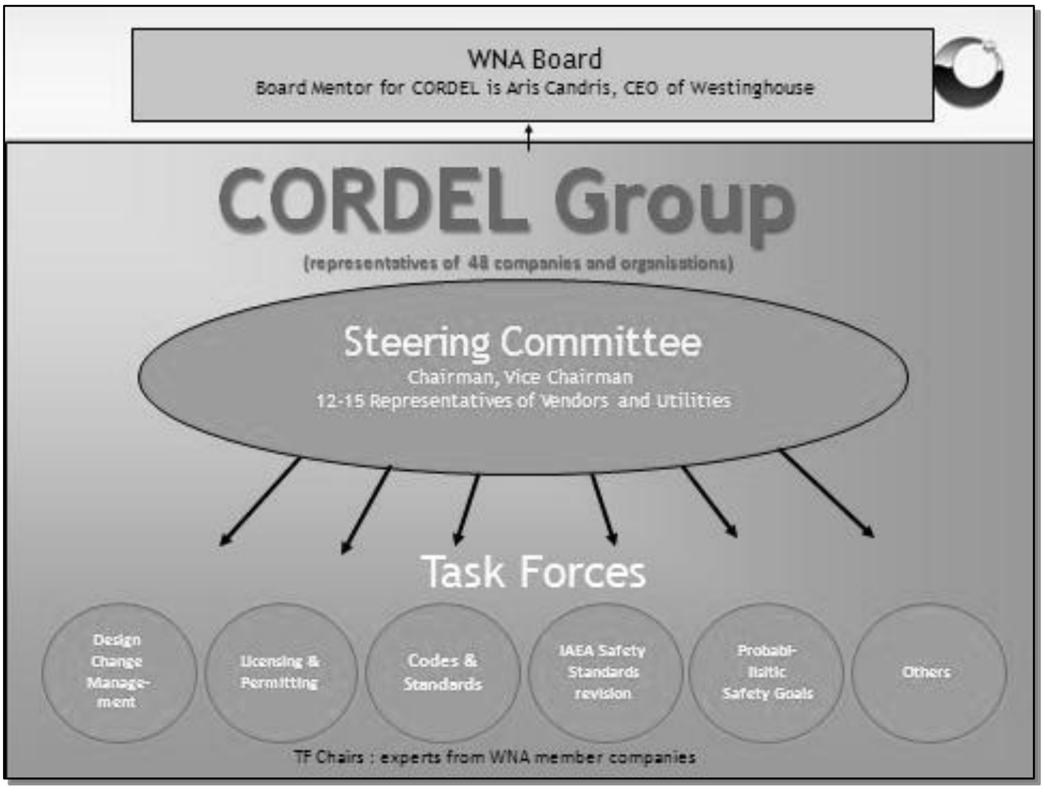
EDF representative presented EDF involvement in EPR's constructions over the world. He gave EDF thoughts about the advantages of standardisation, which is not necessarily equivalent to duplication of a reactor but have to rely on the experience feedback and synergies between projects. He also insisted on the essential regulatory co-operation but moreover highlighted the efforts already undertaken by specific organisations like ENISS or the EPR family and the strong interaction between EPR licensees.

World Nuclear Association (WNA) / CORDEL

Raidis Zemdegs, AECL and CORDEL member

CORDEL Vision and Action Plan

- CORDEL represents "utilities and vendors" to promote "standardization" by proactive interactions with MDEP and other regulatory initiatives. Task Forces have been formed to support and advance the following areas:
  - Codes and Standards -
  - Licensing and Permitting -
  - IAEA Safety Standards -
  - Design Change Management -
  - Probabilistic Safety Goals -
  - SMRs



Action Plan 2011

- Interaction with MDEP & other regulatory initiatives
- IAEA safety standards: -(additional presentation today)*
  - Globalization implies greater use of IAEA Safety Standards and more effective IAEA Safety Standards
  - To be successful - requires much greater input from industry than in the past - Review Safety Classification of SSC (DS 367)*
- Standards and codes TF: (presented by Nawal Prinja on Sept 15)
  - You asked us to look at this
  - Cooperate with SDOs of various countries in convergence of industry codes

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CORDEL - Action Plan 2011

- Probabilistic safety goals TF:
  - MDEP recognized importance of this issue
  - Great relevance to industry
  - Wide variety of PSA methods hinder internationalization
  - TF will comment on and input to IAEA activities
- Licensing and permitting TF (additional presentation today)
  - how regulatory regimes can best reduce project risk.
  - aspects of the regulatory regime better suited for multinational approach

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CORDEL - Action Plan 2011

- SMRs TF:
  - encouraging commercial development
  - Identifying regulatory practices that hinder international deployment
- Design Change Management Task Force:
  - Standardization needs to be maintained throughout life
  - Requires a fleet oversight – who does this?
  - Needs a fleet design authority? Fleet configuration control?
  - Across country boundaries?

6

Action Plan 2011 – Design Change Management

- Fukushima event and related reviews have demonstrated that “design authority” and design change management are not effective – Mark 1 Containment Vent System modifications and implementation across fleet, a large number of issues/deficiencies identified by WANO SOER ++
- Unique Opportunity to examine current gaps, failures, root causes and to institute effective “execution” of design authority and design change management (plant life 60-80 years).
- CORDEL DCM Task Force reviewing industry practices (operators, vendors and owner groups) to propose options for effective implementation.

Action Plan 2011 – Design Change Management

- For example - CORDEL sent a survey request to all owner groups – to date - 5 large owner groups have responded :
  - FROG (Framatome Owners Group)
  - OKD Gidropress (Russian NSSS vendor)
  - COG (Candu Owners Group)
  - PWR Owners Group (USA and International)
  - JPOG (Japan PWR Owners Group)
- Interim results identified interesting insights and some "best practices" to execute "design authority"

Action Plan 2011 – Design Change Management

Deliverables and Target Completion Dates:

- Complete surveys and reviews for the "best in class" practices among the reactor licensees, vendors and owner groups to execute "design authority" that maintains or improves NPP safety over its entire lifetime.
  - TCD. - Q4/2011
- Prepare a report for implementing an "effective change management and design authority" taking into account:
  - Roles of National Regulators, International agencies
  - Roles of Licensee, vendors, owner groups and the public
  - Fukushima and related review lessons learned
  - Potential lessons learned from related industries such as aviation
    - TCD – Q1/2012

Cordel - Future Activities

- Digital I&C
  - Review vendor experience in meeting different regulatory regime expectations
  - Contribute to MDEP's work on I&C
  - Disseminate MDEP positions amongst members
- Comment on regulatory views on post-Fukushima actions concerning new build
  - Comment on any variation of regulatory views
- TF will review probabilistic methods for demonstrating seismic adequacy

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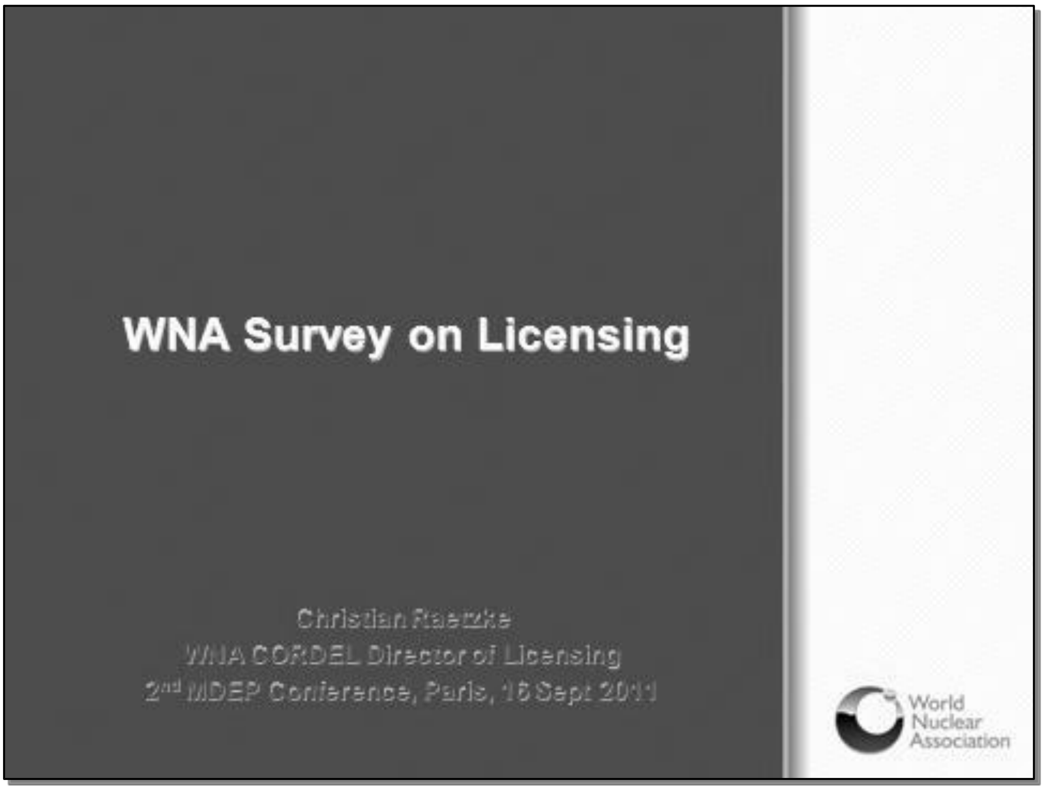
www.world-nuclear.org

World Nuclear Association (WNA) / CORDEL

Christian Raetzke, Co-chair of the WNA task force on licensing and permitting



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WNA Licensing and Permitting Task Force

- Created in 2010
- Jointly sponsored by WNA Working Groups "CORDEL" (Cooperation in Reactor Design Evaluation and Licensing) and "Nuclear Law and Contracting"
- Chairs: Paul Bowden (Freshfields) and Christian Raetzke
- Aims:
  - Promote efficient licensing to reduce uncertainty
  - Foster international harmonisation and standardisation
- Task: draft a Report based on a Survey among WNA member companies

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3

Main Objectives of the Survey

1. Provide governments and regulators with industry's views on how regulatory regimes can best reduce project risk.
2. Support industry members involved as stakeholders in development and review of nuclear regulatory processes.
3. Support industry with international experience on how to manage the licensing/project development interface.
4. Identify aspects of the regulatory regime better suited for a multinational approach than a country-by-country approach.

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4

Scope of the Survey and the Report

- **No duplication of work already being done by institutions such as IAEA, OECD/NEA and EU**
  - IAEA Milestones document (NG-G-3.1) and others
  - OECD/NEA WGRNR work (ongoing)
  - ENEF Licensing Survey and ERDA group
- **All nuclear stakeholders agree that safety and security is paramount in any licensing process**

► **The Survey focuses on the interaction of regulatory processes with the industry's commercial activities, such as procurement, contracting, and finance.**

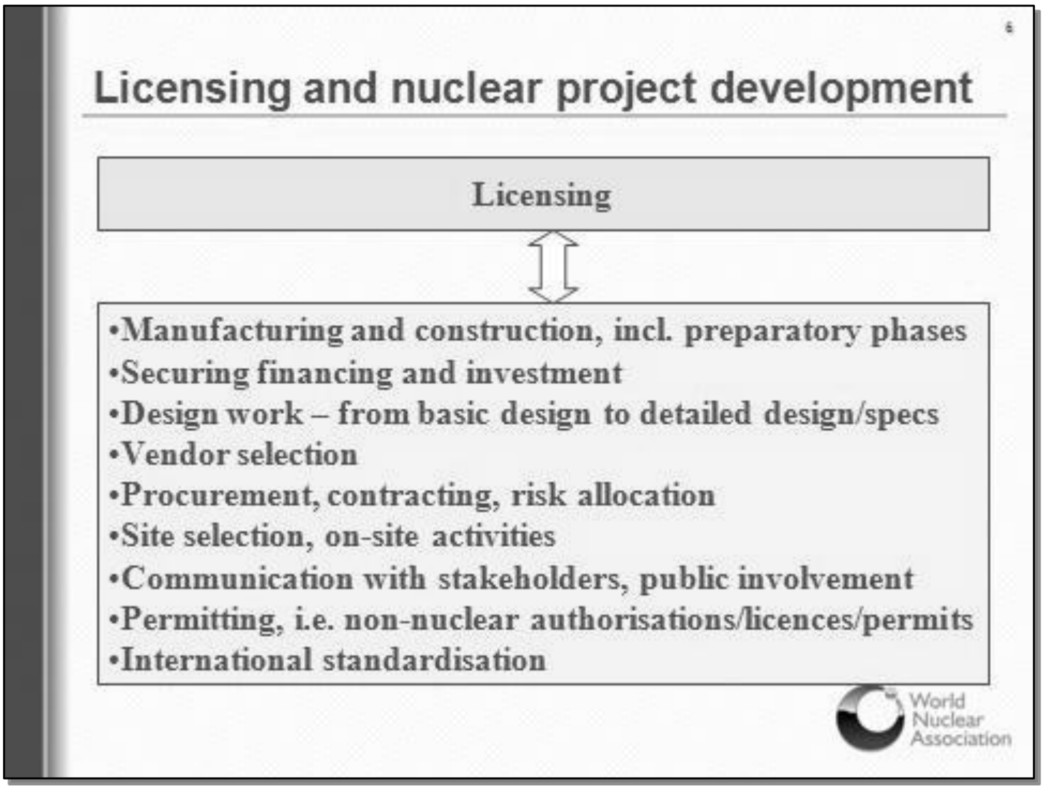
World Nuclear Association

5

Principles

- **It is a "given" that any licensing process must ensure nuclear safety**
- **Generally, there is no single "ideal" licensing regime. Licensing regimes are different because of**
  - History
  - Different needs of established and newcomer countries
  - General legal and regulatory approach
- **Differences may become apparent, for example, in**
  - Possibility of pre-licensing of designs/sites
  - One-step licensing (COL) vs. multi-step licensing
  - Prescriptive vs. goal-oriented approach
- **Main focus is on how to reduce regulatory/licensing uncertainty and facilitate investment**

World Nuclear Association


6
Licensing and nuclear project development
Licensing
•Manufacturing and construction, incl. preparatory phases
•Securing financing and investment
•Design work – from basic design to detailed design/specs
•Vendor selection
•Procurement, contracting, risk allocation
•Site selection, on-site activities
•Communication with stakeholders, public involvement
•Permitting, i.e. non-nuclear authorisations/licences/permits
•International standardisation
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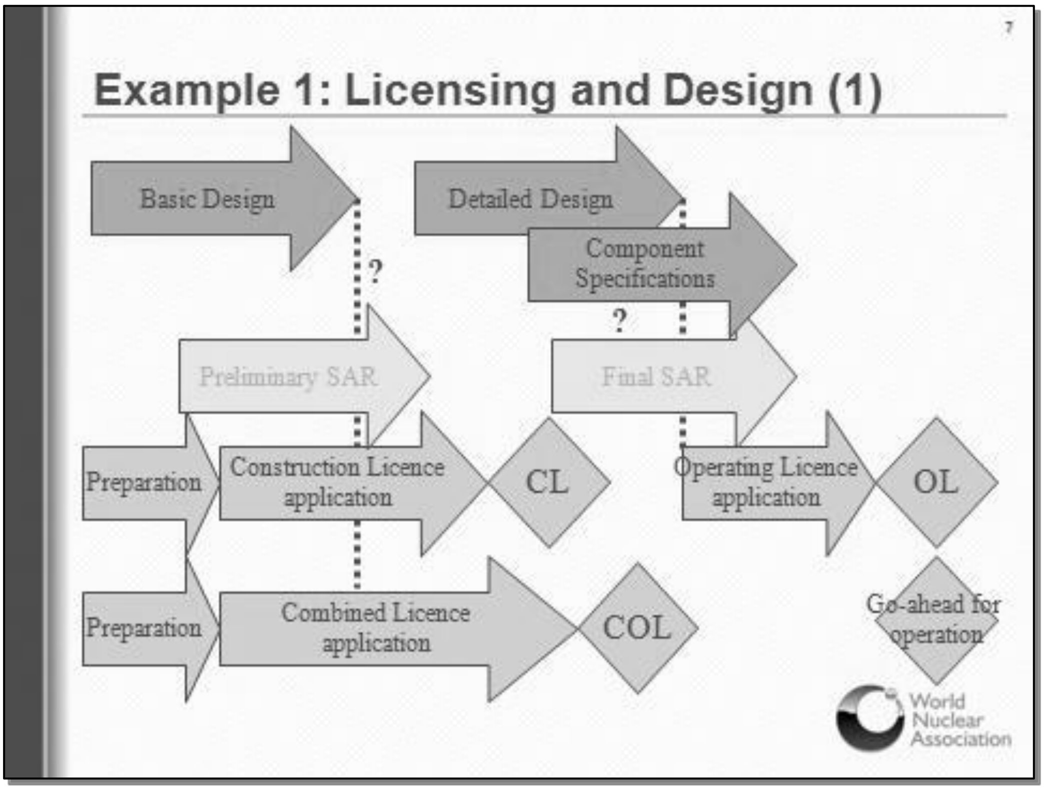
7
Example 1: Licensing and Design (1)
Basic Design
Detailed Design
Component Specifications
?
?
Preliminary SAR
Final SAR
Preparation
Construction Licence application
CL
Operating Licence application
OL
Preparation
Combined Licence application
COL
Go-ahead for operation
World Nuclear Association

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Example 1: Licensing and Design (2)

- Different steps of design work and licensing steps
- When is the design "sufficiently advanced" for the construction licence or for the COL to be applied for / given?
- Obtaining the licence as early as possible (e.g. for enabling site preparation work, securing financing…) vs. waiting for a mature design: what is the priority?
- Preference for a two-step system (construction licence) or a one-step system (COL) – the construction licence needing a lesser degree of design development?

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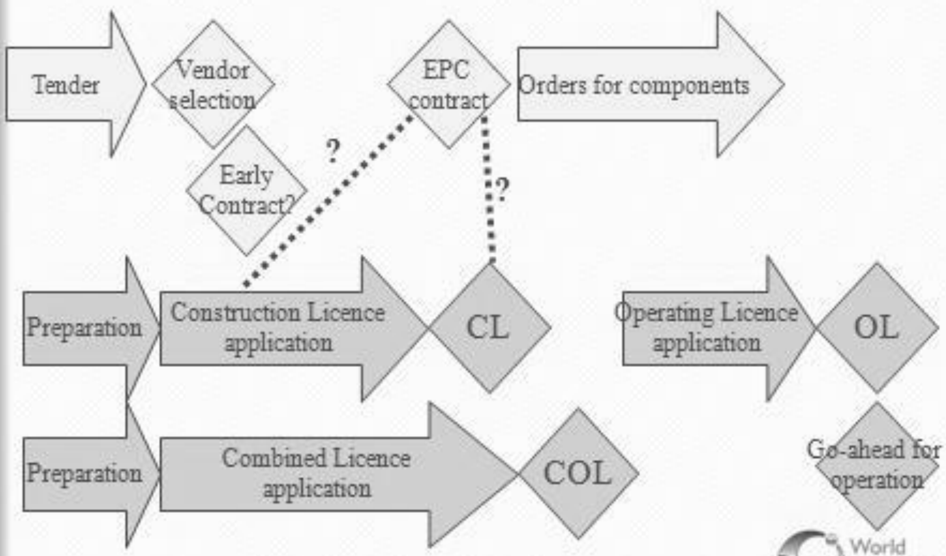
Example 2: Licensing and Contracting (1)



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Example 2: Licensing and Contracting (2)

- Is the choice of overall contract approach (e.g. turnkey or multi-lot) dependent on the licensing system?
- Tendency to finalise contracts as late as possible in the project timeline? Pre-contracts to cover the licence application phase?
- What are the consequences of this on the licensing process?
- What is the link between contracting and the regulator's approach to component manufacturing oversight (CMO)?

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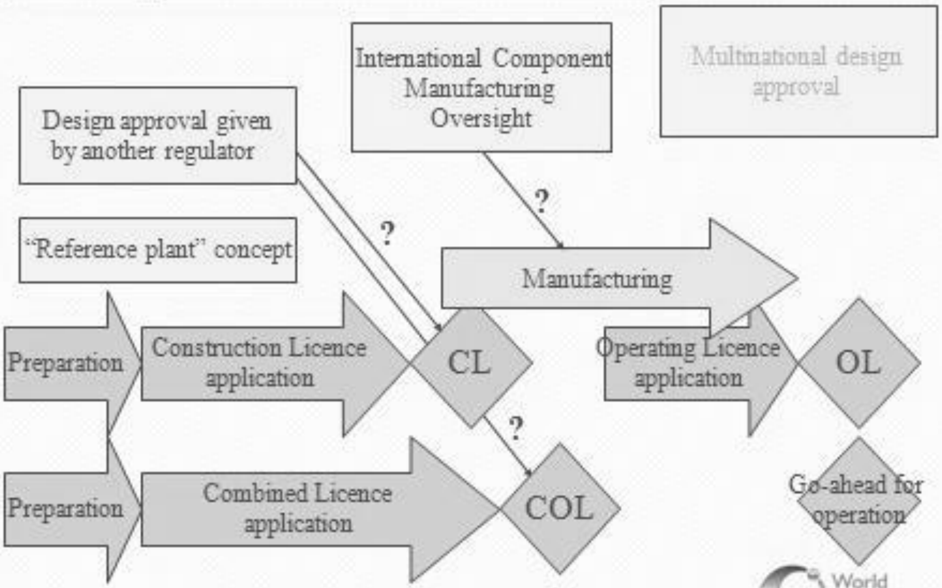
Example 3: Licensing and international developments



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Further issues (1)

Licensing and review of documentation:

- Must be addressed in detail in the contract
- How can the regulator be obliged to keep to timescales?

Licensing and Long Lead Items (*"LLI"s*):

- LLIs ordered before construction licence is awarded?
- Manufactured at the risk of the operator? Preliminary approval from the regulator?
- Project-independent, "off-the-shelf" production of LLIs?

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Further issues (2)

Licensing and FID:

- Financial Investment Decision (*"FID"*) only taken after construction licence?
- Late certainty that NPP will be constructed: implications?

Licensing and site preparation:

- Which preparatory work can be done before (without) the construction licence?

Component Manufacturing Oversight (CMO):

- How can CMO by the national regulator be efficiently incorporated into worldwide manufacturing done by a number of subcontractors?
- Contractual mechanisms to guarantee safety?

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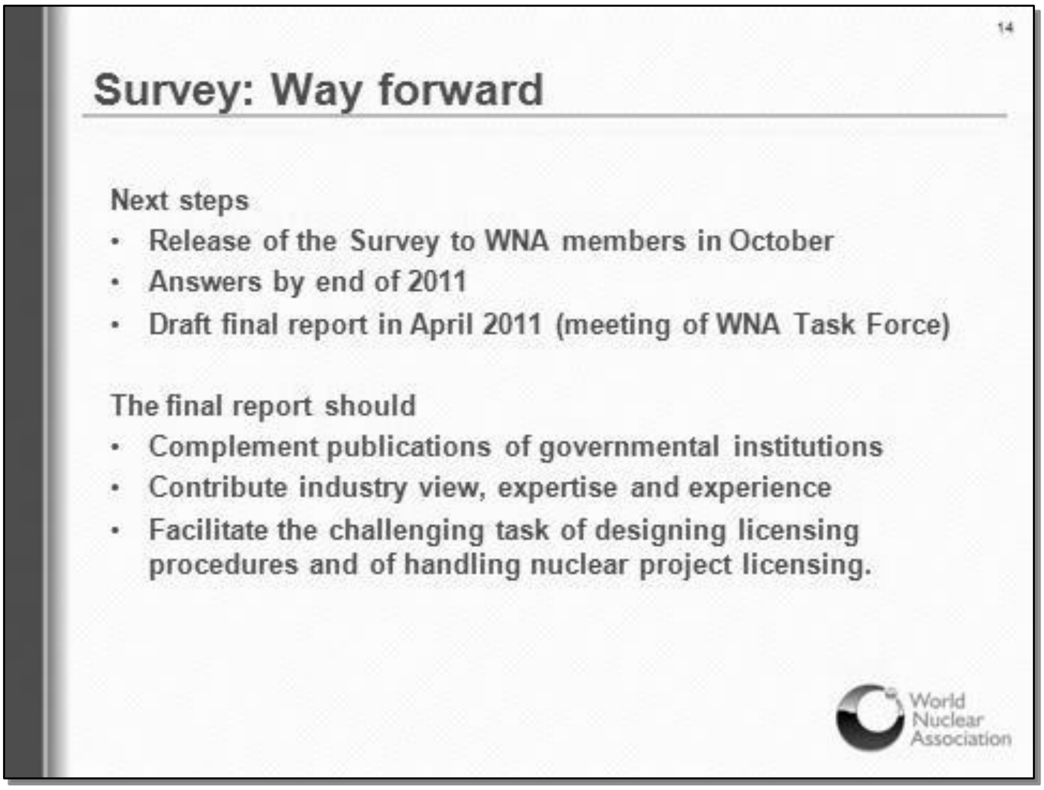
14
Survey: Way forward
Next steps
• Release of the Survey to WNA members in October
• Answers by end of 2011
• Draft final report in April 2011 (meeting of WNA Task Force)
The final report should
• Complement publications of governmental institutions
• Contribute industry view, expertise and experience
• Facilitate the challenging task of designing licensing procedures and of handling nuclear project licensing.
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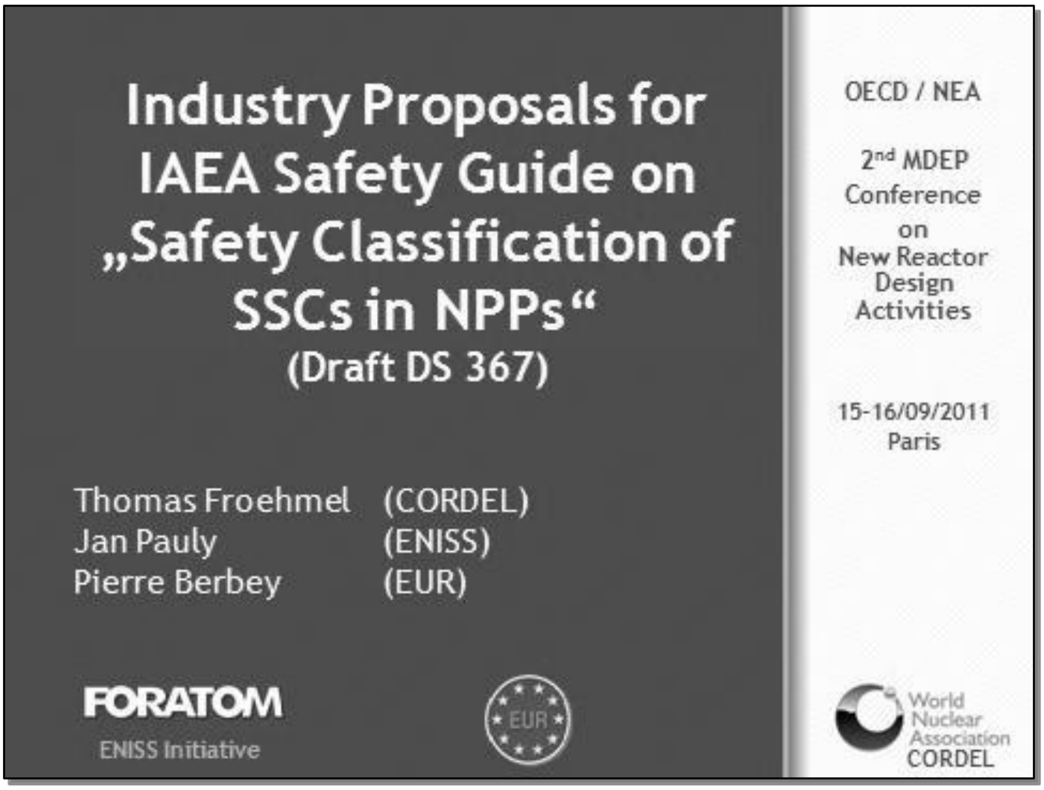
FORATOM-ENISS and WNA/CORDEL Group

Thomas Froehmel, CORDEL representative



Content

- History of IAEA Draft DS 367 until February 2011
- Requirements on Safety Classification of SSC in NPPs
- Approach of IAEA Draft DS 367
- Major Issues
- Industry Proposal for Changes in DS 367
- Conclusions

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History of IAEA Draft DS 367 until February 2011

- Approval of DPP by the NUSSC/CSS: 2007 June
- CSs and TM to prepare the draft 2008-2009

  Strong support: Finland, France, Japan, Russia, South Africa, UK, USA
- Approval of the draft by NUSSC for submission to Member States for comments: 2009 Q-4
- Resolution of Member States' comments: 2009-2010

  Strong support: Finland, France, Japan, Russia, South Africa, USA, ENISS, WNA
- Resolution of NUSSC comments : 2010 Q-4
- Position of NUSSC for submission to CSS : 2011 Q-1
  - MS Comments on DS367 rev. 6.1a should be sent to TO by the 31 December 2010
  - DS367 rev.6.2 were commented by NUSSC Members again by February 2011 without achieving appropriate consensus for submission to CSS

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Requirements on Safety Classification of SSC in NPPs

- Framework of Safety Classification is described in DRAFT SAFETY REQUIREMENTS No. SSR 2/1: "Safety of Nuclear Power Plants: Design", 1 June 2011, endorsed by CSS in May 2011

Requirement 4: Fulfilment of fundamental safety functions

- ➢ identifying items important to safety that are necessary and
- ➢ identifying the inherent features that are contributing to fulfilling or that are affecting the fundamental safety functions in all plant states.

Requirement 16: Postulated initiating events (PIE),

- ➢ identifying a comprehensive set of postulated initiating events.
- ➢ establish the preventive measures and protective measures that are necessary to ensure that the required safety functions will be performed.

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4

Requirements on of Safety Classification of SSC in NPPs

Requirement 16: (continue)

- ➢ expected behaviour of the plant shall be such that the following conditions can be achieved...:

...

(2) following a PIE, the plant would be rendered safe by means of passive safety features or by the action of systems that are operating continuously in the state necessary to control the postulated initiating event;

(3) following a PIE, the plant would be rendered safe by the actuation of safety systems that need to be brought into operation in response to the PIE; or

...

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Requirements on of Safety Classification of SSC in NPPs

Requirement 22: Safety Classification

All items important to safety shall be identified and shall be classified on the basis of their function and their safety significance.

5.34. The method for classifying the safety significance of items important to safety shall be based primarily on deterministic methods complemented where appropriate by probabilistic methods, with due account taken of factors...

1. the safety function(s) to be performed by the item;
2. the consequences of failure to perform a safety function;
3. the frequency with which the item will be called upon to perform a safety function;
4. the time following a postulated initiating event at which, or the period for which, the item will be called upon to perform a safety function.

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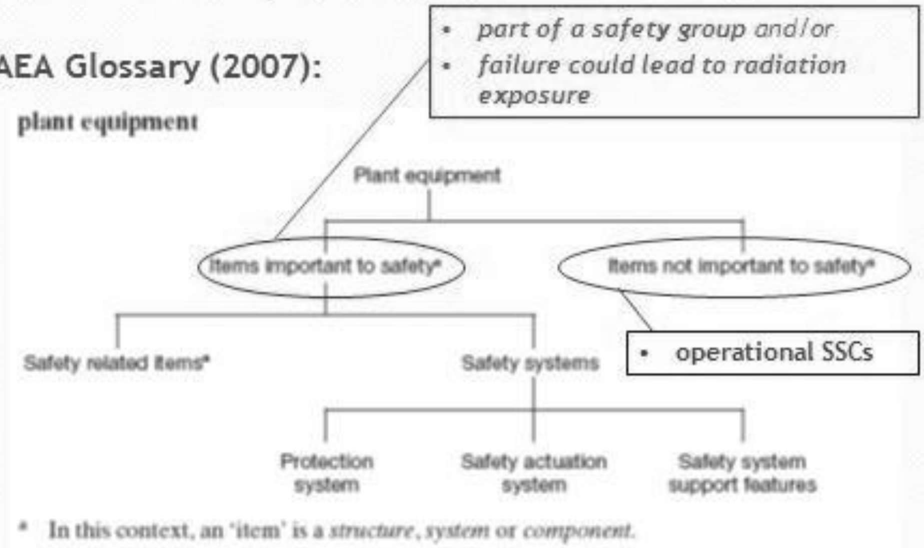
IAEA Glossary (2007):

IAEA Glossary (2007):



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Conclusions for establishing a general approach of safety classification of SSC´s:

- "items important to safety" have to be safety classified and "inherent features" that are contributing to fulfilling or affecting the FSF have to be considered
- reference scale of safety classification are safety functions and the consequences in case of failure (safety significance)
- based on defence-in-depth concept and graded approach
  → adequate and well-balanced safety design of SSC´s in terms of reliability and effectiveness regarding all plant states
  - to prevent deviations from normal operation and failure of items important to safety
  - to control PIE´s in order to bring the plant in a "controlled" and "safe" state as well as
  - to prevent and/or mitigate consequences (harmful effects of radiation)
- compatible to well-established terminology

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General Approach of IAEA Draft DS 367

(4 Feb. 2011)

Main steps in classifying SSCs (Fig. 1)

1. Review and Definition of PIE
2. Identification of reactor type specific, then plant specific preventive and mitigatory safety functions
3. Categorization of safety functions
4. Identification of SSCs or groups of SSCs to perform safety functions
5. Assignment of SSCs that perform safety functions to a safety class
6. Identification of engineering design rules for the design, manufacturing, qualification…

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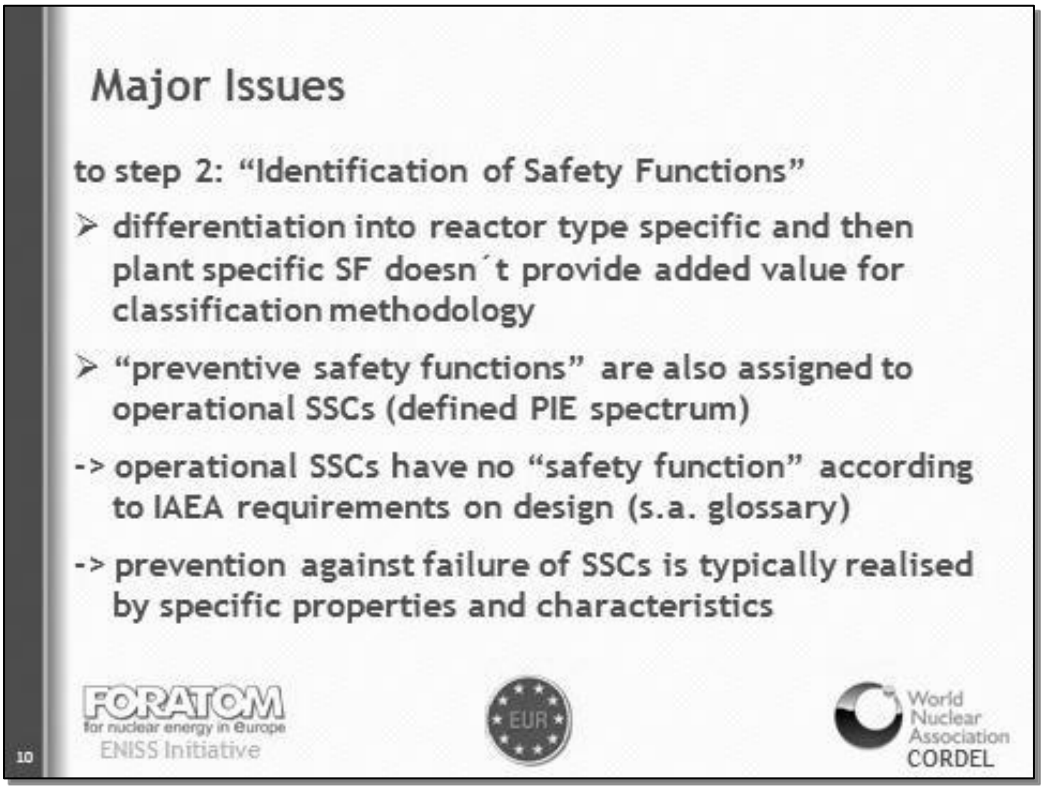
Major Issues
to step 2: "Identification of Safety Functions"
➢ differentiation into reactor type specific and then plant specific SF doesn´t provide added value for classification methodology
➢ "preventive safety functions" are also assigned to operational SSCs (defined PIE spectrum)
-> operational SSCs have no "safety function" according to IAEA requirements on design (s.a. glossary)
-> prevention against failure of SSCs is typically realised by specific properties and characteristics
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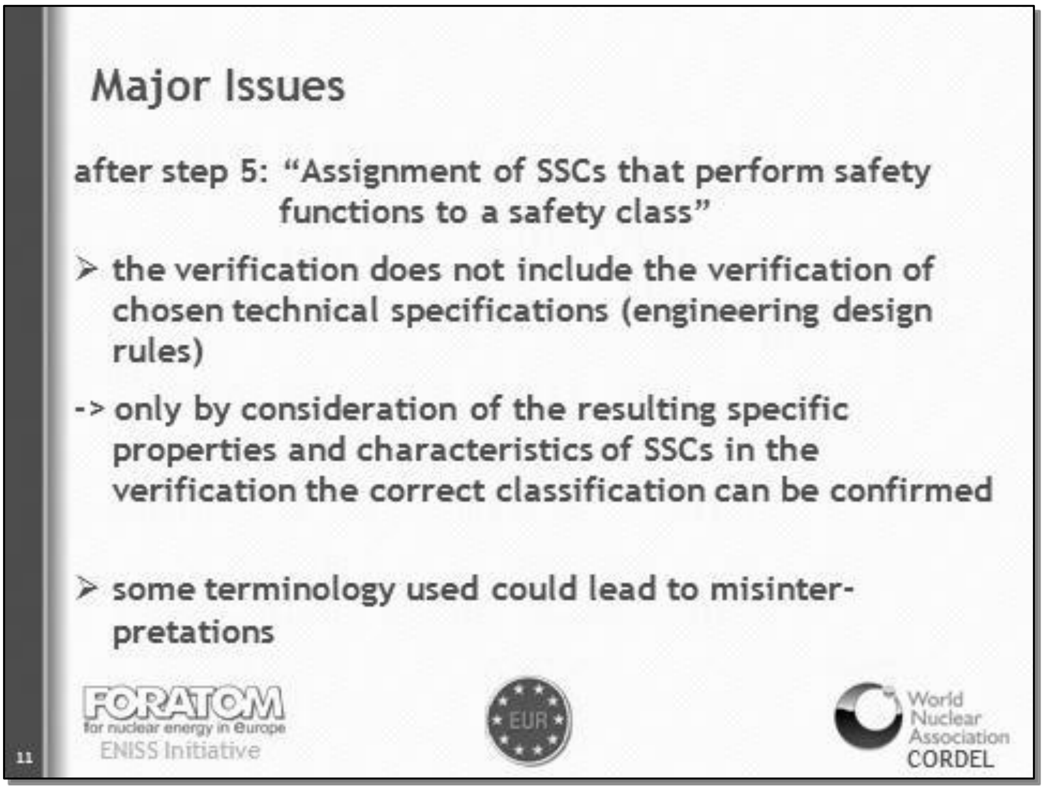
Major Issues
after step 5: "Assignment of SSCs that perform safety functions to a safety class"
➢ the verification does not include the verification of chosen technical specifications (engineering design rules)
-> only by consideration of the resulting specific properties and characteristics of SSCs in the verification the correct classification can be confirmed
➢ some terminology used could lead to misinter-pretations
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Industry Proposal for Changes in DS 367

- agreement in principle with the recommended general approach and methods of safety classification
  - → **large parts of DS 367 are unchanged**
- abandonment of "reactor type specific" SF and introduction of proposals and definitions for "safety function", "provisions" etc.
  - → **improvement of the approach and the terminology**

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Industry Proposal for Changes in DS 367

- expansion of the verification step in order to cover whole classification process
  - → **assuring of a holistic check of SSC classification and design beginning with an adequate PIE selection right up to appropriate engineering design rules**
- use of the term "to control" (a PIE) instead of "to mitigate" (a PIE)
  - → **description of PIE handling and the accomplishment of SF´s in a consistent and stringent way with SSR 2/1**

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Industry Proposal for Changes in DS 367

- determination of provisions for SSC at the end of the classification process instead of assigning "preventive safety functions" in step 2

  → **identification and assignment of properties and characteristics (provisions) for the robustness to withstand potential impacts in order to improve the reliability of SSCs and to prevent failure**

  → **operational SSCs that can cause a PIE are considered in the classification process, e.g. by assigning provisions against failure, without being safety classified**

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Conclusions 1/2

1. The approach of safety classification of SSCs in the drafted Safety Guide (DS367, February 2011) regarding to the structure and steps of classification as well as recommended methods are seen in principle as applicable to new reactor designs.
2. But this complex approach is relatively new and currently not broad used in the design practice so that the evidence to be effective and adequate as well as to be a basis for a recommendable standard method for safety classification have to be still demonstrated.

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Conclusions 2/2

3. Some major critical issues were identified and concrete proposals were elaborated (industry proposals from August 2011) to bring the description of the approach closer to the current best practice and in particular to the requirements on safety design of NPPs as determined in the “Safety Requirements on Design of NPP”, SSR 2/1, (rev. NS-R-1).
4. The industry further proposes to elaborate representative test cases to verify the applicability and robustness of the approach.
5. These test cases should be a substantial input for the IAEA Consultancy Meeting planned for 14-18 November 2011.

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Backup

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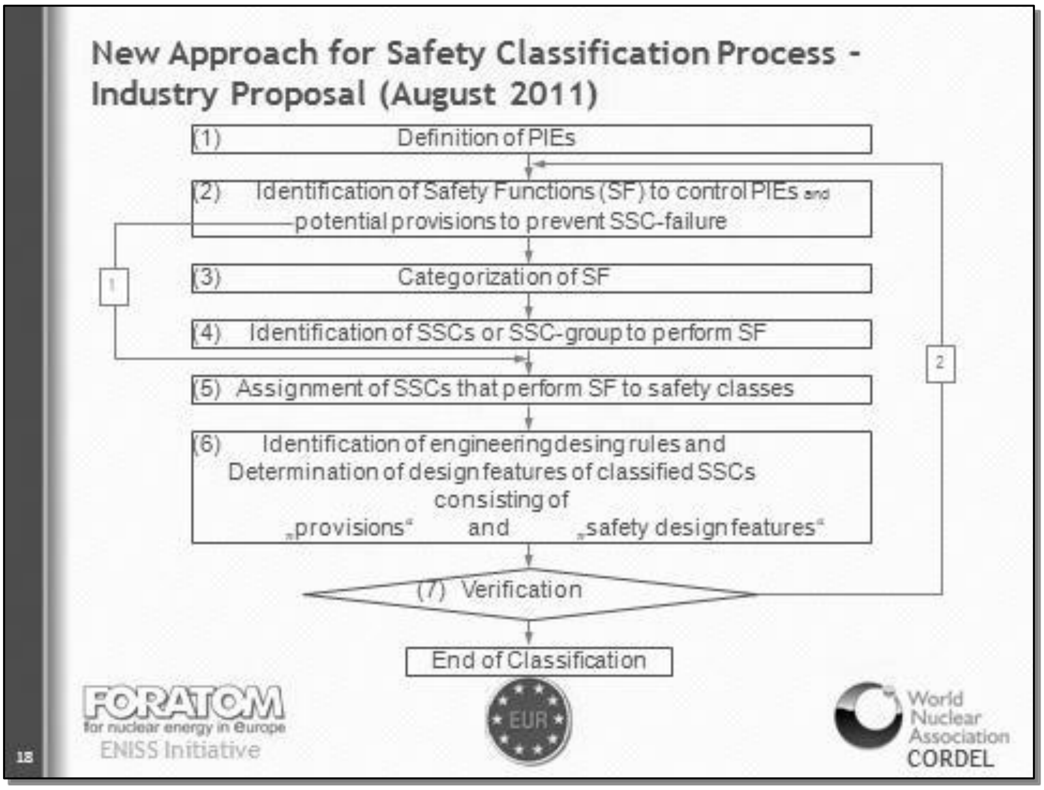

New Approach for Safety Classification Process - Industry Proposal (August 2011)
(1) Definition of PIEs
(2) Identification of Safety Functions (SF) to control PIEs and potential provisions to prevent SSC-failure
(3) Categorization of SF
(4) Identification of SSCs or SSC-group to perform SF
(5) Assignment of SSCs that perform SF to safety classes
(6) Identification of engineering desing rules and Determination of design features of classified SSCs consisting of
„provisions" and „safety design features"
(7) Verification
End of Classification
1
2
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United States Nuclear Regulatory Commission (US NRC)

Gary Holahan, Deputy-Director, Office of New Reactors, US NRC

U.S.NRC
United States Nuclear Regulatory Commission
Protecting People and the Environment

MDEP Response to CORDEL proposal

- MDEP supports harmonization.
- MDEP supports cooperation that makes stronger regulators.
- MDEP agrees that information sharing on design assessments is already in place.
- Industry should take steps to improve the international standardisation of its work.
- Validating and accepting design approvals of other countries remains an objective worth considering further; however, it is the responsibility of the local country's regulator to understand the design well enough to oversee construction, maintenance, operation, emergency preparedness, and decommissioning.
- International design certification is not viable.

2

U.S.NRC
United States Nuclear Regulatory Commission
Protecting People and the Environment

Safety Classification

- Issue

➢ Several MDEP working groups identified that the use of different approaches in the safety classification schemes employed by members is an impediment to cooperation

- Actions

➢ MDEP will focus its efforts on providing input to a draft IAEA standard, DS-367, rather than initiating a new project on this topic

➢ MDEP member countries submitted comments on DS-367 separately

- Next Steps

➢ MDEP STC will consider developing a position on the IAEA standard

3

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United States Nuclear Regulatory Commission
Protecting People and the Environment

MDEP input to International Standards

- MDEP Digital I&C Working Group encouraged IEEE and IEC joint cooperation
- MDEP Codes and Standards Working Group encouraged a Code comparison project by the Standards Development Organizations (AMSE, JSME, AFCEN, KEA, CSA and NIKIET) and obtained a commitment to work together to minimize further divergence.
- IAEA participates in the work of MDEP
- MDEP contributes to IAEA standards review
- MDEP developed a position paper on Safety Goals and presented at an IAEA meeting.

4

South Africa's National Nuclear Regulator (NNR)

Peter Bester, South Africa STC member, NNR

Countries with Small Nuclear Programmes

Common problems faced by small regulators include:

- Dealing with imported technology,
- Codes and Standards as discussed in Session 4
- Difficulties in implementation of full scope of the vendor's modifications, operating practices
- Regulator having to deal with the same range of technical issues as the bigger regulators.
- Deviation from the modifications of the vendor country also results in problems in terms of not having a sufficiently large family of similar plants for OE purposes, and acquisition of spares parts.

Standardisation might also help to reduce the cost which would enable the smaller countries to keep abreast and would be be extremely desirable in this regard.

New Countries Embarking on NPP programmes (1/2)

Issue: We might be faced in future with the prospect of new countries licensing nuclear power plants that have not been licensed elsewhere

- IAEA initiatives and support programmes in place assisting countries to establish legal and regulatory infrastructure needed for NPP's
- FNRBA initiatives in infancy stage working towards convergence and harmonising of regulatory standards and practices recognising international safety standards and conventions
- New countries will face similar problems as small countries but also issues relating to competence and credibility of authorisation processes


New Countries Embarking on NPP programmes (2/2)
Question: What can be done to ensure that if such a scenario arise that safety is not compromised?
• Harmonisation of standards: address credibility of authorisation process
• Standardisation of designs: address issues as mentioned for small regulators
• Recognise limitations of local technical infrastructure and environmental conditions that could impact safety, security, safeguards and EP.
• Ensure that proven technologies suitable for the local factors are available on the market that have been licensed/certified elsewhere and have pedigree.
• Support countries with credible programmes to establish national infrastructure

Olkiluoto 3 Project

Marjo Mustonen, OL3 Nuclear Safety Manager and Director of Construction, TVO

SESSION 7 - INDUSTRY INITIATIVES ON NEW REACTOR DESIGNS, UTILITY'S BENEFITS

- Utility's benefits from a standardized plant concept and large installed base of similar plants are evident
- Plant level benefits: operational experience feedback, review of disturbances, ageing mechanisms, organisational topics, etc. → improved safety
- Utility benefits as service / equipment purchaser: competent service / equipment suppliers who have large enough installed base for gathering experience and expertise → improved safety and better economic efficiency

*Example: TVO's experience with OL1/2

TVO

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2

SESSION 7 - INDUSTRY INITIATIVES ON NEW REACTOR DESIGNS, TVO SITUATION:

- TVO has now OL3 EPR project ongoing
- TVO is preparing for OL4 project with five different reactor alternatives included in the feasibility studies
- Finnish licensing requirements control the work; it is important to be able to freeze the regulatory requirements in the beginning of the project
- Multinational co-operation brings collective expertise in evaluation of new plant designs, especially certain areas such as severe accidents
  - **Potential benefits of multinational authority co-operation could be for licensing procedures, e.g. enhance manufacturer certification and approval of off-the-shelf components (serial manufactured)**
  - **Requirements which significantly affect the structures, systems and components are important to be harmonised**
  - **In any case, in each country, the prevailing conditions (site related requirements, environmental conditions, seismicity) must be taken into account in the design and sizing of the structures and equipment -> this should not affect the plant concept itself**

TVO

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SESSION 7 - INDUSTRY INITIATIVES ON NEW REACTOR DESIGNS

•What TVO is doing/enhancing with respect to Industry Initiatives for OL4 nationally:

- licensing plan
- regulatory requirements – YVL Guides are being renewed
- "approvable" plant concept in the beginning of licensing
- harmonization of licensing and project activities

- International regulatory co-operation and harmonization of requirements as well as utility co-operation is needed for longer perspective

TVO

4

TVO

THANK YOU

GE Hitachi Nuclear Energy

Jerry Head, Senior Vice-President, Regulatory Affairs, GE Hitachi Nuclear Energy

In this role, I am responsible for managing our licensing team and providing leadership and strategic guidance for all the nuclear licensing activities in our business (New Plants, Services, and Fuel). I manage the business relationship with the Nuclear Regulatory Commission, co-ordinate related industry interfaces with organisations such as NEI and INPO, and provide expert knowledge about the US NRC rules and regulations. I also lead international licensing efforts for the business.

My experience in the nuclear industry started with research reactor operations followed by initial startup testing of a BWR. Since that time, I have spent over 26 years in the commercial nuclear power industry in engineering roles of increasing responsibility involving both PWR and BWR reactor technology. My experience includes core design, Operations, probabilistic and deterministic safety analysis, plant system and design engineering, and support of numerous plant licensing efforts including power uprates and license extensions.

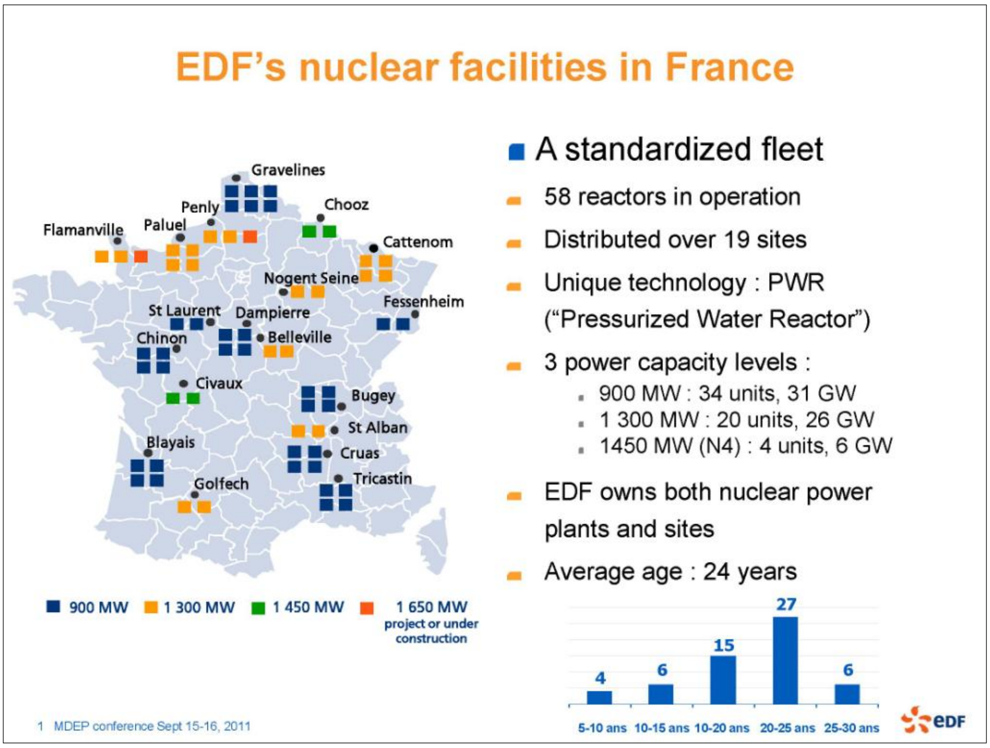
I have Bachelors and Masters degrees in Nuclear Engineering from Texas A&M University and I am a licensed Professional Engineer.

Remarks:

Regulatory stability, internationally and within a specific country, is a key concept when designing the next generation of nuclear power plants. Standardisation of design provides safety, schedule, and cost benefits in construction and subsequent operation. Standardisation of design requires, where possible, a standard but, more importantly, a stable regulatory framework. It is recognised that significant lessons learned such as the Japan earthquake must be addressed in licensing regimes. To do anything less would be irresponsible. However, it is important that the regulators of the world work together to appropriately balance technical adequacy, political environments, and risk-benefit to quickly arrive at the appropriate regulatory **framework** going forward. Note the singular context, I didn’t say **frameworks,** as I am an optimist that the work underway here is moving us in that direction.

EDF

Xavier Pouget-Abadie, Senior Safety Advisor, EDF


EDF's nuclear facilities in France
Gravelines
Penly
Chooz
Flamanville
Paluel
Cattenom
Nogent Seine
St Laurent
Dampierre
Fessenheim
Chinon
Belleville
Civaux
Bugey
St Alban
Blayais
Cruas
Golfech
Tricastin
900 MW
1 300 MW
1 450 MW
1 650 MW project or under construction
A standardized fleet
58 reactors in operation
Distributed over 19 sites
Unique technology : PWR ("Pressurized Water Reactor")
3 power capacity levels :
900 MW : 34 units, 31 GW
1 300 MW : 20 units, 26 GW
1450 MW (N4) : 4 units, 6 GW
EDF owns both nuclear power plants and sites
Average age : 24 years
4
6
15
27
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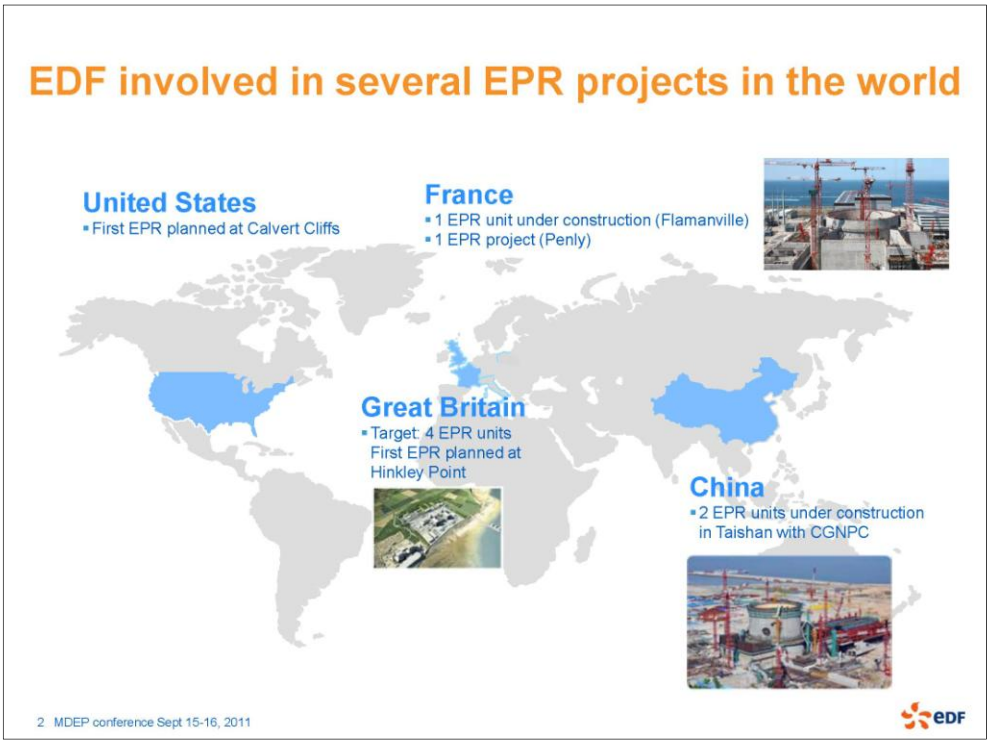
5-10 ans
10-15 ans
10-20 ans
20-25 ans
25-30 ans
1 MDEP conference Sept 15-16, 2011
EDF


EDF involved in several EPR projects in the world
United States
First EPR planned at Calvert Cliffs
France
1 EPR unit under construction (Flamanville)
1 EPR project (Penly)
Great Britain
Target: 4 EPR units
First EPR planned at Hinkley Point
China
2 EPR units under construction in Taishan with CGNPC
2 MDEP conference Sept 15-16, 2011
EDF

Standardization and series effect for plant design

- Standardization and series effect do not mean strict duplication but should rely for a reactor design on the following:
  - Adaptability of safety demonstrations and of plant design to specific country and site conditions
  - Same core of main design features (main SSCs of the Nuclear Island)
  - Benefit of the experience feedback and potential synergies between projects
- Evolutions are necessary to avoid for a nth new project using the same technology to be a FOAK
  - Harmonized regulatory framework or mutual recognition mechanisms between regulators
- EDF together with other utilities develops actions to promote harmonization and standardization through specific organizations
  - The European Utility Requirements (EUR)
  - European Nuclear Installations Safety Standards (ENISS)
  - The EPR family

3 MDEP conference Sept 15-16, 2011

The European Utility Requirements

- EUR : a mature cooperative organization of European utilities
- EUR : a hub to harmonize European utilities views and requirements and to interact with major external stakeholders
  - Regulators : safety (WENRA), HV grid…
  - Vendors
  - International organizations: IAEA, EU, WNA
  - EUR counterparts outside Europe : EPRI, Asian utilities
- The EUR document
  - A generic GEN3 LWR specification
  - A list of preselected designs
  - A living document: Rev D of Volumes 1&2 in mid 2012, Rev E in a longer term

4 MDEP conference Sept 15-16, 2011

ENISS: European Nuclear Installations Safety Standards Initiative

- FORATOM/ ENISS representing nuclear licensees of the EU
- Interaction with WENRA in a constructive dialogue through the RHWG and the WGWG
  - Reference Levels for operating reactors
  - "Stress tests" specifications in the light of the Fukushima event
  - Safety objectives for new reactors
- Interaction with IAEA through assistance in IAEA drafting groups
- Interaction with the European Commission
  - EU safety directive
  - Long Term operation
  - "Stress tests"

5 MDEP conference Sept 15-16, 2011

The EPR Family : synergies and series effect between EPR projects

- Within the EDF group and in interaction with AREVA and TVO
  - Sharing safety and licensing issues and lessons learned
  - Sharing construction experience and best practices
  - Sharing procurement and information technology
  - Preparing for commissioning and operation
  - Coordinating our public acceptance initiatives
- In interaction with MDEP through the EPRWG
  - Making available information and data to explain and understand differences existing between different EPR projects
  - Promote harmonized principles, methods and solutions resulting in the same level of safety for all EPR family plants

6 MDEP conference Sept 15-16, 2011

SESSION 8

CONCLUDING PANEL

SESSION 8 SUMMARY

Gregory Jaczko, U.S.A. Policy Group member chaired this session. The following persons provided views and/or presentations regarding conclusions from conduct of this conference:

- André-Claude Lacoste, MDEP Policy Group Chair;
- Philippe Knoche, Chief Operating Officer of AREVA who replaced Mr. Luc Oursel, President and Chief Executive Officer, AREVA;
- Dominique Lagarde, Director of New Nuclear Engineering, EDF;
- Masaki Morishita, Deputy Director General, Japan Atomic Energy Agency (JAEA);
- Satinder Singh Bajaj, Chair, India's Atomic Energy Regulatory Board (AERB)
- Jukka Laaksonen, Chair, Western European Nuclear Regulators' Association (WENRA)
- Luis Echávarri, Director General, OECD Nuclear Energy Agency

All panel members agreed that MDEP efforts fostered positive and productive relationships among the regulators and that the goals of harmonisation and convergence of regulatory requirements, when a safety benefit is a result, are desirable. Also the discussions during the preceding 2 day-conference were also very conducive to opening the dialogue between MDEP members and other stakeholders such as non-MDEP regulators and industry organisations.

MDEP members on the panel expressed the challenging work on harmonisation of regulatory requirements and also stressed the role that industry has in standardising and harmonising designs and industry requirements.

Industry representatives expressed a desire to maintain open lines of communication with MDEP, that they have seen increased interactions with MDEP regulators, and encourages mutual recognition of other regulator's findings, as appropriate and with a focus on safety.

Mr. Morishita, as a mechanical Standards Development Organisation representative, highlighted the work of the SDOs in comparing the various codes and the progress being made as a result and that the SDOs support MDEP activities and goals.

Mr. Bajaj highlighted the benefits of MDEP activities and sharing information with non-MDEP regulators. MDEP activities are relevant to India's AERB because of the developments of nuclear power in India. And there are other countries that may benefit also from increased exchanges with MDEP. Korea and Russia mentioned the desire to potentially form design-specific working groups on the APR1400 and advanced VVER designs, respectively.

As WENRA representative, Mr. Laaksonen, encouraged keeping the working groups functioning efficiently, especially in the areas of co-operating on specific designs.

Mr. Echávarri expressed OECD NEA's support for MDEP activities and the importance of MDEP as a unique multinational initiative.

Mr. Jaczko, as Chair of this concluding panel, acknowledged the progress being made on MDEP activities since the last MDEP conference in September 2009 and generally opened the floor to comments and questions by rhetorically asking what might be accomplished or what issues might be addressed within MDEP between now and a potential 3rd MDEP Conference in late 2013.

Mr. Lacoste cautioned to go step by step in the harmonisation area of requirements and to communicate with key stakeholders. Vendor inspections and the final work of the VICWG wer highlighted as a needed area to focus on by Mr. Laaksonen.

Industry representatives agreed that the safety classification of structures, systems, and components is an area in which MDEP may be able to work to encourage harmonisation of approaches. And generally working on processing to allow recognition of other regulator's work should be pursued.

Other areas of interest expressed included exploring the scope of the work of the design specific working groups perhaps to include commissioning and operational issues.

Other topics discussed included the desire from non-MDEP regulators to be included in MDEP activities whether through membership expansion or observation of MDEP activities. The importance of incorporating relevant lessons learnt from Fukushima was a common theme.

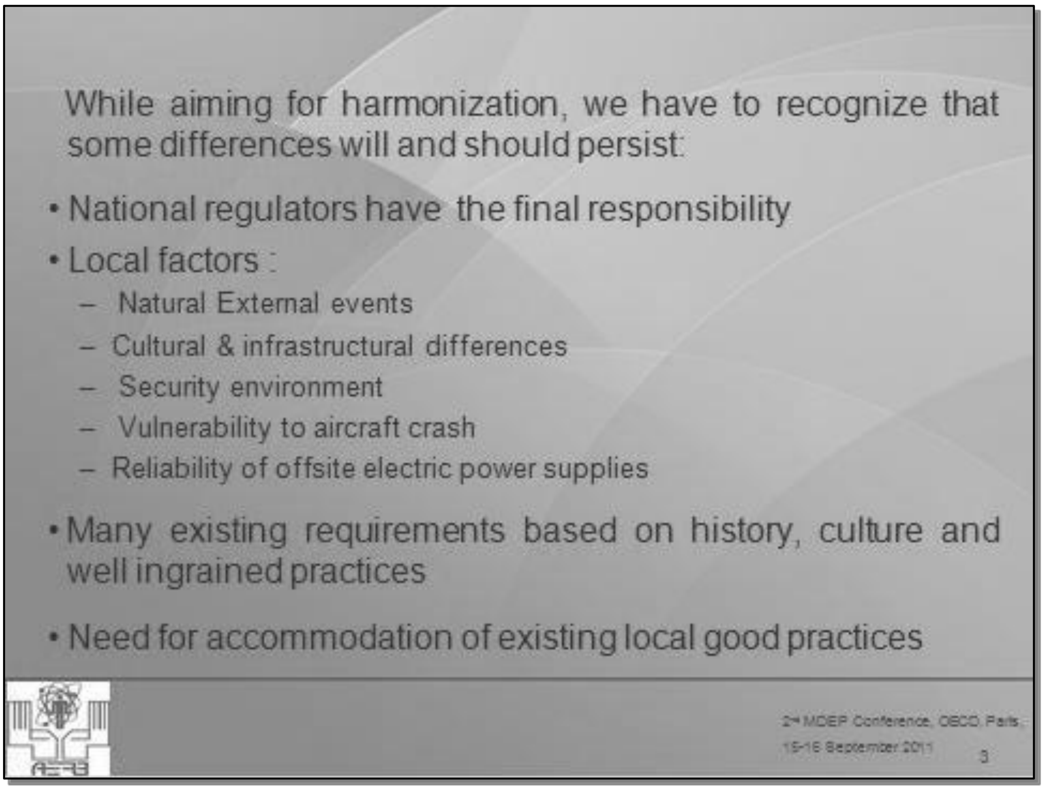
It was also expressed by MDEP members that MDEP is a unique long term programme that focuses on interim results such as key events like this Conference in communicating MDEP activities and common positions. The Policy Group will decide how long the MDEP will last. The Policy Group also looks forward to seeing the STC self assessment report in a timely manner that will address some of the issues broached during this session. Mr. Jaczko agreed that MDEP should focus on a few safety issues and address those subjects in a comprehensive and relevant manner.

Generally the Panel like the idea of conducting a 3rd MDEP Conference on New Reactor Design Activities in late 2013.

AERB

S.S. Bajaj, Chair, AERB


• MDEP is a unique initiative
– Bringing together regulators from different countries
– Efforts towards harmonization of safety requirements
• Deliberation in this conference provide ample evidence that the initiative is a success
2nd MDEP Conference, OECD, Paris, 15-16 September 2011
2


While aiming for harmonization, we have to recognize that some differences will and should persist:
• National regulators have the final responsibility
• Local factors :
– Natural External events
– Cultural & infrastructural differences
– Security environment
– Vulnerability to aircraft crash
– Reliability of offsite electric power supplies
• Many existing requirements based on history, culture and well ingrained practices
• Need for accommodation of existing local good practices
2nd MDEP Conference, OECD, Paris, 15-16 September 2011
3

Regulatory Process in India

- India has long-standing regulatory review experience in different designs of NPPs (PHWRs, FBRs and VVERs)
- Regulatory control for new NPPs involves several consent stages:
  - Siting
  - Construction (typically up-to three sub- stages)
  - Commissioning (several stages culminating in full power operation)
  - Regular operation
- At each stage comprehensive safety review, in a multi-tier structure, is carried out before clearance.

2nd MDEP Conference, OECD, Paris, 15-16 September 2011 4

India's Nuclear Power Program

- Present generation capacity of around 4700 MWe is derived from 20 reactors,
  - 18-PHWRs (220-540 MWe) and 2-BWRs (160 MWe)
- Plans to add substantial nuclear capacity
- Currently two VVERs (1000 MWe) are nearing completion and under commissioning
- 4 units of 700 MWe Indian PHWRs and one 500 MWe FBR are under construction
- Future plans for expansion includes multiple units of Indian PHWRs imported LWRs, including EPR and AP-1000

2nd MDEP Conference, OECD, Paris, 15-16 September 2011 5

Relevance of MDEP for India

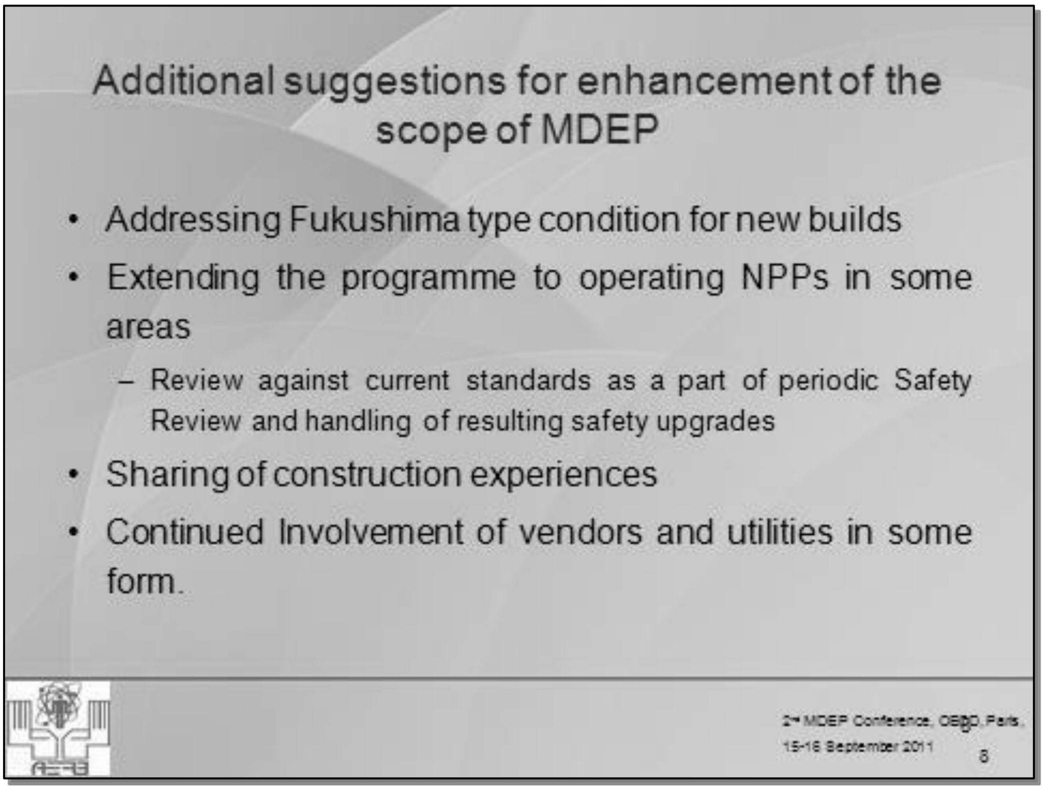
- With large number of facilities and diverse designs to be regulated, AERB needs to optimize its resources
- MDEP could be a very helpful platform for sharing knowledge and review experiences with other regulators
- Review results can be directly adopted in areas which have national requirements similar to MDEP criteria
- Thus India looks forward to very fruitful participation in the activities of MDEP

2nd MDEP Conference, OECD, Paris,
15-16 September 2011 6

Observations

- Some aspects of EPR design reviewed by AERB as part of Technical Assignment review for proposed EPR project at Jaitapur, India
- A few key issues surfaced during such review
  - the use of "break preclusion" concept, safety classification of SSCs and digital C&I for protection system.
- Different regulatory regimes have taken different approach in resolving these issues
- We will be interested to see if convergence in these areas is possible.

2nd MDEP Conference, OECD, Paris,
15-16 September 2011 7


Additional suggestions for enhancement of the scope of MDEP
• Addressing Fukushima type condition for new builds
• Extending the programme to operating NPPs in some areas
– Review against current standards as a part of periodic Safety Review and handling of resulting safety upgrades
• Sharing of construction experiences
• Continued Involvement of vendors and utilities in some form.
2nd MDEP Conference, OECD, Paris,
15-16 September 2011

CONCLUSION AND CLOSING OF CONFERENCE

Mr. André-Claude Lacoste, MDEP Policy Group Chair provided his concluding presentation and remarks at the end of the Conference.

Mr. Lacoste provided his views of the Conference and the status of the MDEP including addressing the following areas:

- MDEP expected outcomes
- The status of MDEP after four years in its current programme structure
- MDEP perspectives and challenges including the work towards harmonisation, potential expansion of membership in MDEP, the expected self assessment report and recommendations from the Steering Technical Committee, incorporating lessons learnt from the Fukushima accident
- Expectation from Industry stakeholders including the need for active involvement from the industry, standards development organisations, and licensee

It was again mentioned the possibility of holding a 3rd MDEP Conference on New Reactor Design Activities in approximately two years.

ASN

André-Claude Lacoste, Chair, ASN
MDEP Policy Group (PG) Chair

MDEP expected outcomes

- **Setting up an enhanced cooperation among regulators :**
  - To improve the effectiveness and efficiency of regulatory design reviews
  - To raise the safety assessment quality and the safety level
  - To facilitate convergence of regulatory requirements

MDEP After 4 Years of Work

- **MDEP is an effective and efficient expert network from different regulators**
  - Greater understanding in national requirements and practices
  - Work on Common Positions
  - Increase of Members' efforts and involvement
- **Comprehensive programmes of work**
- **MDEP products**
- **Increased interactions with industry stakeholders**

1. MDEP Perspectives and Challenges

- **Convergence of regulatory practices and regulatory requirements**
  - Will be a long process
  - Time for Self-Assessment of MDEP Activities and achievements
  - Need for in-depth discussions within MDEP Policy Group on orientations to be given to MDEP
    - → *Harmonization / Convergence*
    - → *New NPP Commissioning and Operation*

2. MDEP Perspectives & Challenges

- **MDEP Enlargement**
  - **Membership** : New regulators interested
  - **Design Specific WG** : Regulators expressed their interest in creating new DSWG
  - → **To be discussed and anticipated by MDEP**


3. MDEP Perspectives & Challenges
Fukushima : Improvements to be implemented are at the same time an individual and a collective responsibility for Regulators, Vendors, SDOs, Operators, etc.
Programme of work to be defined as soon as first results from national and international safety assessments available
Interactions with other international organisations
High expectations from nuclear industry stakeholders
A-C. Lacoste - Conclusion of the Conference
Page 6


Expectations from Industry Stakeholders
To achieve its goals MDEP needs :
The active involvement of all stakeholders : Regulators, Vendors, SDOs and Operators for an enhanced international cooperation, in MDEP and outside
A-C. Lacoste - Conclusion of the Conference
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APPENDIX A

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