NEA
NUCLEAR ENERGY AGENCY

Multinational Design Evaluation Programme

Julien HUSSE

NEA

MDEP Technical Secretariat

MDEP Basics

What is MDEP? And why…

A unique multinational initiative undertaken by national regulatory authorities of 14 countries to:

- Co-operate and share information on safety design reviews of specific designs in order to ensure a greater safety focus on the reviews in each country

  🡐 New wave of new reactor designs in 2000s : EPR, AP1000… after a long period without new builds + new challenges on issues such as digital I&C

- Share information about national and international regulatory requirements and practices in order to explore opportunities for possible harmonisation or convergence of such requirements when safety enhancements may be realised

  🡐 Opportunity for better understanding. Prior to MDEP, reviewing new designs was not the priority for cooperation

MDEP expects that higher levels of safety will be achieved in the design and operation of new reactors *(STC position)*

MDEP Basics

Who is involved in MDEP activities?

- Canada
- China
- Finland
- France
- Japan
- Republic of Korea
- Russian Federation
- South Africa
- U.K.
- U.S.A

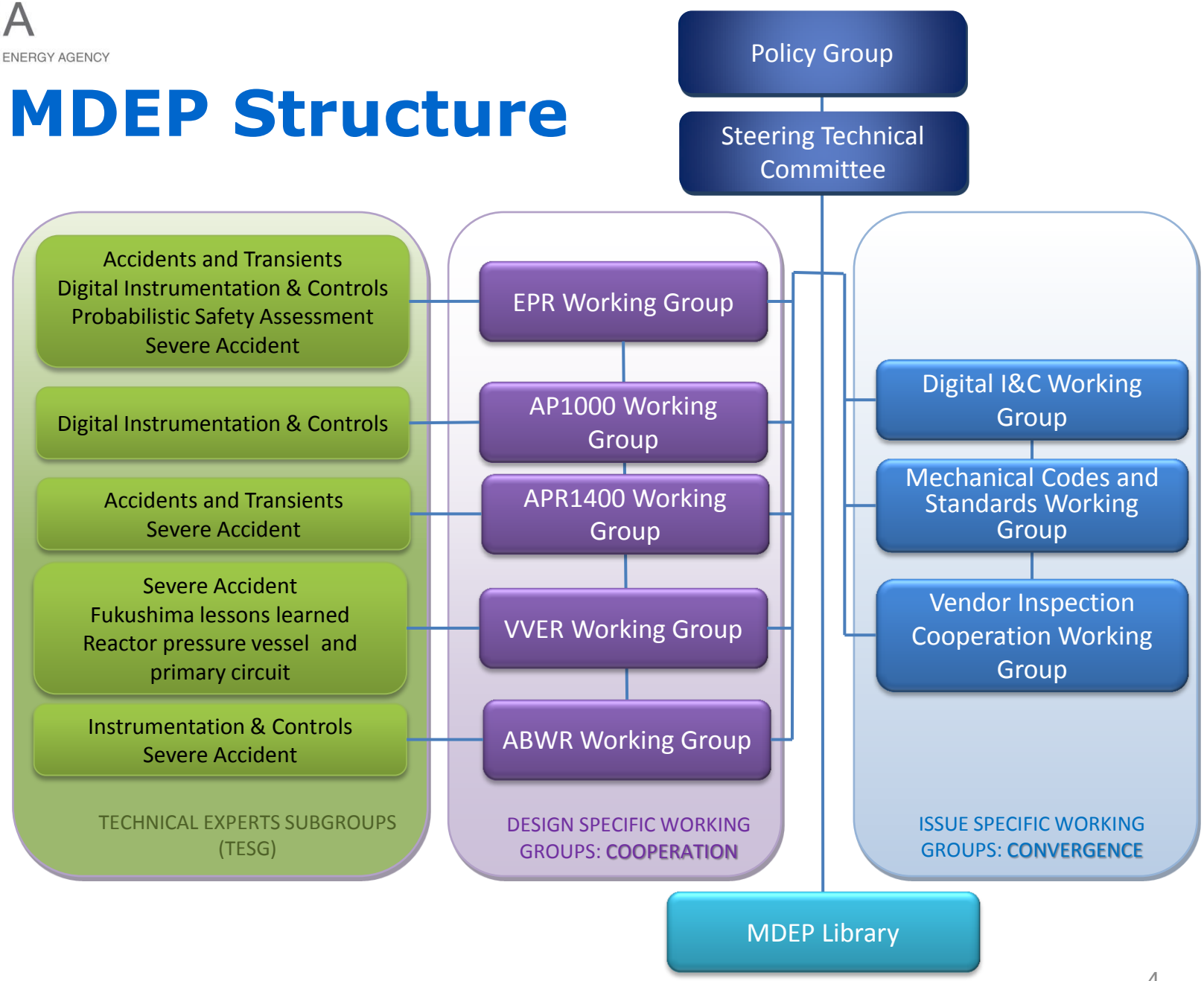
Since MDEP inception in 2006

- India - Joined in 2012
- United Arab Emirates - Joined in 2012 as an associate member
- Sweden - Joined in 2013
- Turkey - Joined in 2013 as an associate member

- NEA: technical secretariat
- IAEA: takes part in generic activities
- National technical support organisations participate if requested by the national regulatory authority.

NEA
NUCLEAR ENERGY AGENCY

MDEP Structure



MDEP Terms of Reference

Generic Terms of Reference

- National sovereignty
- Understanding and harmonisation of practices
- Common positions
- Formation of working groups *(≥3 members, 1 design)*
- Structure *(PG, STC, WG)*
- Membership *(Criteria)*

Specific Terms of Reference

- Organisation
- Expected outcomes
- Programme plan
- Sharing proprietary information
- MDEP library
- Communication protocol

Set of internal procedures

Policy Group and STC latest developments/activities

- 2015 Milestone to assess the future of MDEP
  - PG will discuss mid and long term MDEP strategies
  - Initiated a data collection as a tool to inform future of MDEP
  - Potential new topics (concrete containment codes, specific regulatory challenges with passive systems, cooperation in new reactors operation stage)
  - Potential completion or transfer of activities of issue-specific WGs
- Membership expansion (new members in 2012, 2013, early consideration for potential new ones)
- Commissioning activities
- To set up a common line of activities among DSWGs
- Discussions with stakeholders
  - Regular meetings of STC with the industry, WNA/CORDEL
  - MDEP Conferences

3rd Conference (↻ 2-3 years) on new reactor design activities (May 2014)

- 150 attendees
  - National regulators, international organisations, nuclear industry (vendors, designers, licensees, applicants…) and standard development organisations
- 7 sessions
  - Design-specific working groups
  - Commissioning activities
  - Vendor inspections
  - Digital instrumentation and controls
  - New reactor activities related to the Fukushima Daiichi accident
  - Codes and standards harmonisation
  - MDEP way forward and related activities
- Messages from stakeholders and considerations for future of MDEP
  - Industry needs a regulator forum to discuss issues
  - Harmonisation of regulatory practices (from CPs to regulation)
  - Consideration of reviews from other regulators
  - Management of knowledge (support to new design reviews)
  - Reduction of differences among designs
  - Consideration of next generation reactors

Design-Specific Working Groups

- Develop Common Positions
  (EPR Digital I&C design, EPR Fukushima lessons learned, AP1000 squib valves)
- Share issues identified, questions to applicant, and draft safety evaluations
- Identify differences among various country designs + potential for harmonisation
- Identify additional questions for applicants based on MDEP interactions
- Discuss technical topics within TESGs
- Discuss commissioning activities
  (initial test programmes)

Design-Specific Working Groups

Common positions related to Fukushima

Consideration of impact of the accident on new designs
Requested by the STC

- **EPR common position**

  Core common position
  + 5 appendices

  Published:
  - Long Term Loss of Electrical Power
  - Management of primary circuit cooling and sub-criticality

  To be published early 2015:
  - Reliability and qualification of severe accident management instrumentation
  - Pressure management of containment during severe accidents
  - Long-term cooling of the fuel pools

- **AP1000WG – APR1400WG**

  Moving forward following EPRWG template

- **VVERWG**

  Formed a TESG

- **ABWRWG**

  Focus on improvements in safety, hazards, etc. Slightly different set than EPRWG

Design-Specific Working Groups

EPRWG Common positions related to Fukushima

Core common position

- Relevance of safety objectives for Gen III reactors *(lower probability of core melt, limitation of releases, management of severe accident situations…)*
- Accidents with core melt: *the EPR design benefits from reinforced measures to prevent accident situations such as high pressure core melt, global hydrogen detonations and in-vessel and ex-vessel steam explosions, which would lead to large or early releases. However, cliff-edge effect for AC/DC power ➔ need for reinforcement of provisions for power supply*

Long-Term Loss of Electrical Power (LTLEP) (appendix 1)

- Physical separation, barriers, and design margin ➔ *EPR design appropriately accounts for external and internal events to make the likelihood of an LTLEP extremely low*
- Permanently installed equipment and mobile means to provide multiple layers of defence ➔ *approach acceptable*

EPRWG – DI&C discussions

Common position and technical report related to EPR Digital I&C

Common position on the EPR Instrumentation and Controls design (December 2010) ➔ identified regulatory issues to be generically addressed

- Design, quality and qualification of digital devices
  - ↳ DICWG common positions 3 and 11
- Data communications independence
  - ↳ DICWG common position 4
- Design simplicity
  - ↳ DICWG common position 6

EPR specifics: Technical report on EPR I&C (2014, not public yet)

- Data communications independence between safety classes
  - ↳ Design modifications on US, UK and OL3 EPR

"Overall, the meetings and interactions have deepened the understanding and appreciation for other member's regulatory processes and requirements. Such understanding will assist global harmonisation and standardisation of nuclear power plant designs in the future"

EPRWG – DI&C discussions

Technical report on EPR Digital I&C

Messages to applicants

- Expectation for documentation
  - ✓ Submit an adequate level of design description
    clear and appropriate analyses as to how safety goals are achieved and regulatory and safety requirements are fulfilled in the reactor design
  - ✓ Ensure that equipment selected for a design can meet regulatory requirements
    if commercial grade equipment is used for safety class systems
  - ✓ Demonstrate how new technology/equipment meets regulatory requirements
    qualification of embedded programmable technology in plant equipment and smart I&C devices

AP1000WG – Technical issues

Common position on the design and use of explosive -actuated (squib) valves in nuclear power plants (December 2010)

Absence of regulatory experience with valves of this type

- Expectations for design, qualification, procurement and in-service activities (such as examination, inspection, testing and maintenance)

Design modification following regulatory review

Passive Residual Heat Removal (PRHR) System ➔ condensate recirculation losses

- December 2011: UK ONR GDA questions original condensate return assumption
- Issue assessed by regulators following MDEP discussions
- AP1000 design changes ➔ modifications to gutters returning condensates to IRWST

Issue-Specific Working Groups

- CSWG
  - Completed comparison of pressure boundary for Class 1 pressure vessels, piping, pumps, and valves in coordination with standards development organisations (SDO)
  - Publication of a set of 4 CSWG technical reports to support codes and standards harmonisation
  - Obtained commitments from SDO to work together to minimise further divergence of code requirements
  - ↳ CORDEL published a harmonisation proposal for certification of NDE personnel ➔ first step
- DICWG
  - Develops common positions (10 published, 2 more from initial programme plan)
  - ↳ Used as basis for
    - harmonised regulatory response to applicants and vendors
    - Harmonisation of standards (IEC, IEEE)

Issue-Specific Working Groups

VICWG

- Performed more than 50 witnessed, joint or multinational inspections
- Developed inspection protocol for conducting inspections
- Compares quality assurance requirements used in the oversight of vendors
  - First multinational inspection (US NRC, UK ONR, FR ASN) in Valinox Nucléaire, France, in 2014
  - Lessons to be learned to assess benefits for regulators as well as vendors

- Develops a list of good practices for vendor oversight
- Experience considered in the regulation for vendor inspection in Japan, Korea and the UK

MDEP Publications
MDEP public website

Examples

- **Annual Report March 2013-March 2014**
- Technical report on lessons learnt on achieving harmonisation of codes and standards for pressure boundary components in nuclear power plants
- Technical report on the Fundamental Attributes for the design and construction of reactor coolant pressure-boundary components
- Technical report on findings from code comparisons and establishment of a global framework towards pressure-boundary code harmonisation
- Technical report on the Common Quality Assurance / Quality Management (QA/QM) Criteria for Multinational Vendor Inspection
- EPR common position on Fukushima related issues
- Digital I&C common positions

http://www.oecd-nea.org/mdep/

NEA
NUCLEAR ENERGY AGENCY

Full members:


Canada


China


Finland


France


India


Japan


Republic of Korea


Russian Federation


South Africa


Sweden


United Kingdom


United States

Associate members:


Turkey


United Arab Emirates

THANK YOU FOR YOUR ATTENTION, Question?