



5th MDEP Conference on new reactor design activities

International Co-operation: Past, Present and Future

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MDEP ACTIVITIES AND ACCOMPLISHMENTS HPR1000 DESIGN SPECIFIC WORKING GROUP

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Chair

Content of the Presentation



- **Introduction of the HPR1000 WG**
- Activities and Accomplishments of HPR1000 WG
- Benefits from MDEP Products for the WG Members
- Conclusion and new activities (2023-2024)

Introduction of HPR1000 Working Group

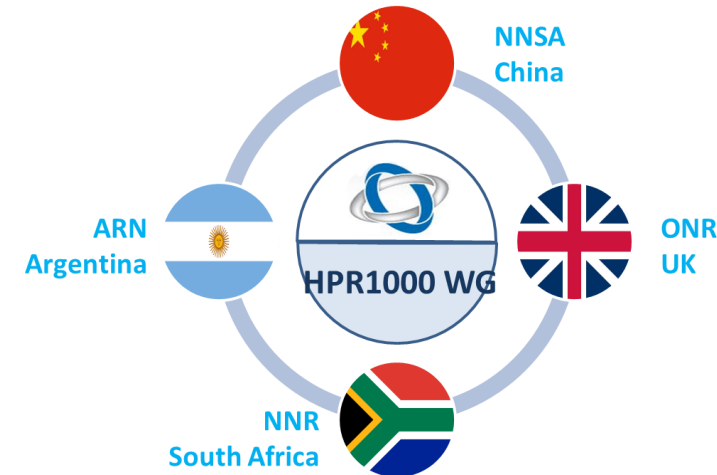
➤ HPR1000 WG started activities in 2018 with the participation of four Members:

- ❑ Argentina, China, South Africa and United Kingdom
- ❑ United Kingdom left the DSWG activities by the end of 2022

➤ In addition, two Technical Expert Sub-Groups (TESGs)

were established in order to address specific technical areas of interest of DSWG Members:

- ❑ Internal and External Hazards TESG
- ❑ SA TESG



Introduction of HPR1000 Working Group



➤ Goals:

- Leverage national regulatory resources by sharing information and experience on the regulatory safety design reviews of the HPR1000 with the purposes of enhancing the safety of the design and enabling regulators to make timely licensing decisions to ensure safe designs
 - Exchange experience on licensing process and design reviews, lessons learnt and design related construction, commissioning and operating experience
 - Work to understand the differences in regulatory safety review approaches in each country to support potential use of other regulators safety design evaluations
- Promote safety and standardisation of designs through cooperation
 - Identify and understand key design differences including those originating from regulatory requirements
 - Document common positions on aspects of the review to enhance safety and standardisation of the design. Communicate MDEP members' common positions to vendor and operators regarding the safety
 - Use experience gained in learning about similarities and differences in regulatory requirements to identify potential paths forward to a safety benefit

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Activities and Accomplishments of HPR1000 WG

- In accordance to the Work Plan (till end of 2022) the following main topics were discussed:
 - ❑ Fukushima Daiichi accident lessons learnt, including Vienna Declaration
 - ❑ Severe Accidents
 - ❑ Unique design features affecting safety
 - ❑ Treatment of external and internal events
 - ❑ First Plant Only Tests (FPOT)
 - ❑ High Integrity Components (HIC)



Activities and Accomplishments of HPR1000 WG

- ❑ HPR1000 WG meetings: 2 times per year
- ❑ TESG meetings: 2 times per year
- ❑ Meetings agenda included (but not limited to):
 - Share of experience and exchange of information about regulatory activities and status of HPR1000 project in each Member country, including main review concerns, design changes, construction events, manufacturer events, commissioning events, etc.
 - Development of comparison table of differences in HPR1000 designs
 - Discussions of safety related issues and concerns
 - Preparation of Common Position / Technical Report and related discussions
- ❑ Up to end of 2022, 9 WG Meetings and relevant TESG meetings were held.

Activities and Accomplishments of HPR1000 WG



- HPR1000 WG produced 4 Common Position Papers and 3 Technical Reports:
 - ❑ Common Position Addressing Fukushima Daiichi NPP Accident – Related Issues
 - ❑ Common Position of the IRWST Strainer Performance and Downstream Effects of HPR1000 after LOCA
 - ❑ Common Position Addressing In-Vessel Retention Strategy for HPR1000
 - ❑ Common Position Addressing the Vienna Declaration on Nuclear Safety for HPR1000 (Draft)
 - ❑ Technical Report on Regulatory Requirements and Practices for Severe Accidents
 - ❑ Technical Report on Hydrogen Control During Severe Accidents
 - ❑ Technical Report on Internal and External Hazards

Activities and Accomplishments of HPR1000 WG



- **CP-HPR1000WG-01: Common Position Addressing Fukushima Daiichi NPP Accident – Related Issues**
 - This document identifies common preliminary approaches and regulatory expectations to address potential safety improvements for HPR1000 plants, as related to lessons learned from the Fukushima Daiichi accident or Fukushima Daiichi-related issues.
 - It contains six sections: evolutionary improvements in safety, hazards, reliability of safety functions, accidents with core melt, spent fuel pools, and emergency preparedness in design. In each section, design consideration of HPR1000 are described in detail.

- **Common Position Addressing the Vienna Declaration on Nuclear Safety for HPR1000**
 - This document reflects the common understanding of the principle 1 of Vienna Declaration and how the HPR1000 design complies with this principle. In order to develop this common position, the HPRWG members had a thorough discussion focused on how the design should practically eliminate the early radioactive release or large radioactive release
 - It considers the CP-STC-02, as well as practice of other MDEP DSWGs

Activities and Accomplishments of HPR1000 WG



- **CP-HPR1000WG-02: Common Position of the IRWST Strainer Performance and Downstream Effects of HPR1000 after LOCA**
 - This paper presents the regulatory expectations regarding the IRWST strainer performance and downstream effects of HPR1000 after LOCA.
 - Regulatory positions about design measures for reducing the risk of excessive blockage of the IRWST strainer and loss of long-term core cooling.

- **CP-HPR1000WG-03: Common Position Addressing In-Vessel Retention Strategy for HPR1000**
 - Considering that the national regulatory requirements of member countries regarding the IVR are of general nature, and detailed regulatory requirements are not given, the purpose of this CP is to present an acceptable approach to IVR design and safety assessment strategy for the HPR1000.
 - Section 2 introduces the main design features and assessment strategy of HPR1000 IVR, and an acceptable approach to HPR1000 IVR design and assessment is presented in Section 3 covering the following: scenario identification, corium configuration, effectiveness assessment and system design.

Activities and Accomplishments of HPR1000 WG



- **TR-HPR1000WG-01: Technical Report on Hydrogen Control During Severe Accidents**
 - In line with other Working Group, like EPR, AP1000, VVER etc. This document compiles the information provided within the responses to a survey and summarizes the information presented by each regulators.
 - It contains 13 sections related to the HPR1000 Containment Combustible Gas Control System (CCGCS), including PARs location principle, regulatory requirements, safety classification, qualification test, ignition by PAR, hydrogen monitoring, maintenance, shutdown events and consideration of SPF building.
 - In each section, design feature and analysis philosophy are described in detail.

- **TR-HPR1000WG-02: Technical Report on Regulatory Requirements and Practices for Severe Accidents**
 - This document summarises the regulatory requirements and expectations of the regulators, and highlights where consensus or differences exist. It compiles the results of a survey regarding various aspects of the regulation, analysis, and management of severe accidents.
 - It contains 5 sections, namely, definition of a severe accident, relevant legislation, requirements and guidance, severe accident analysis, reactor design, and Severe Accidents Guidelines and Procedures.

Activities and Accomplishments of HPR1000 WG



➤ TR-HPR1000WG-03: Technical Report on Internal and External Hazards

- This technical report is based on the responses provided to a questionnaire that was developed to capture the regulatory approaches used in relation to identifying, characterizing, screening, and assessing hazards in each member country.
- The purpose of this report is to identify the similarities and differences in regulatory approaches, and where applicable, to identify common positions for safety in relation to hazards and/or the conclusions of the safety analysis for the HPR1000 design.
- Four sections, namely, overview of approaches to hazards, pipe breaks, dropped loads, and combined hazards, are incorporated.

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Benefits from MDEP Products for the WG Members



- The discussions and exchange of information between the Members provided fruitful insights in addition to those ultimately captured in the deliverables of the HPR1000 WG Programme. These insights helped each regulator to:
 - ❑ Understand the level up to which national regulatory requirements, expectations and practices are aligned with other WG regulators and harmonized to the best international practices and standards
 - ❑ Improve the design review and licensing process by
 - Benefiting from other WG regulators' experience in reviewing specific design features affecting safety and issues of concern
 - Reducing regulatory uncertainty
 - Building up (in a timely manner) of in house capacity for the review and assessment
 - Strengthening the regulatory activities while contributing to keep a high public trust and confidence

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Conclusion and new activities (2023-2024)



- MDEP has shown to be an effective and useful platform for understanding the differences in regulatory safety review approaches in each country, sharing information and experience on the regulatory safety design reviews and other licensing stages of the HPR1000, as well as discussing and coordinating the technical position of various regulatory bodies.
- HPR1000 WG is considering following potential new activities:
 - Investigate the potential of the new activity for Supply Chain
 - Investigate the potential of the new activity for the PSA application
 - Develop a HPR1000 WG work programme for Accident Analysis & Transients
 - Workshop with the industry in 2024

Thank you for your kind attention!

