

**1<sup>st</sup> Topical Peer Review**  
**Public event – 22<sup>nd</sup> November 2018**  
**Brussels**

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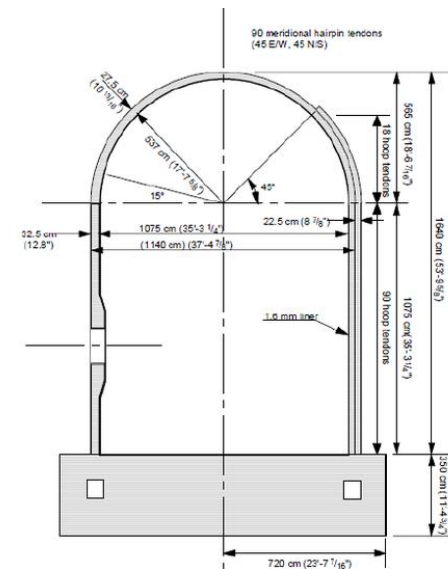
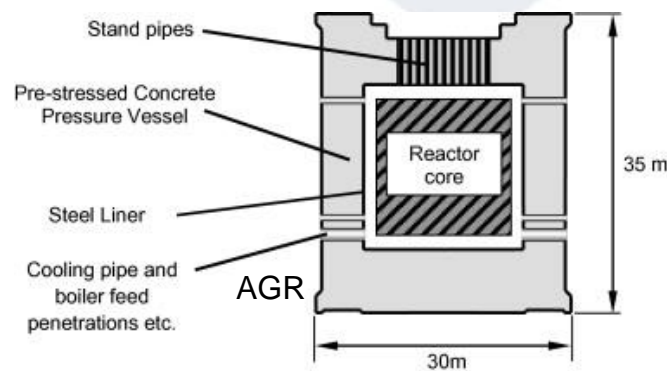
**PM, Concrete Containment and PCPV structures**

# OUTLINE

- **Scope of the Thematic Group**
- **Review Process**
- **Workshop outcomes**
- **Conclusions**

## 1<sup>st</sup> Topical Peer Review: Scope

- Irreplaceable concrete structures
- The structure of the TS applies to both the concrete containment structures and the PCPVs
- Scope

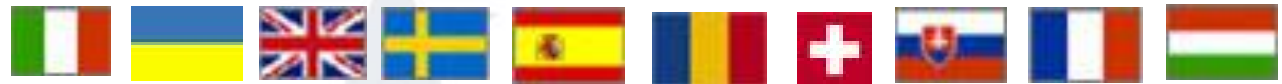


PWR, CANDU, BWR, VVER,  
RESEARCH REACTORS

- Concrete structure itself
- Concrete structure that surrounds the preceding or a steel containment

## 1<sup>st</sup> Topical Peer Review: Review Process 1/2

- Thematic review group: Concrete Containment and PCPV
- 9 Experts + Rapporteur + Project Manager
- From 10 nationalities



- From different backgrounds
  - Regulator
  - TSO
  - Independent engineering consulting company
- Review of the National Assessment Reports and the adequacy against the WENRA TS.
- Each NAR reviewed by at least two experts (not from their own country)

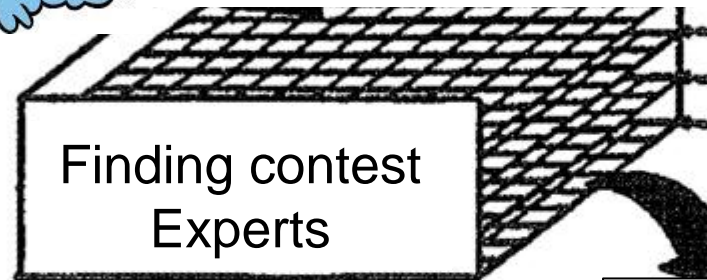
## 1<sup>st</sup> Topical Peer Review: Review Process 2/2



155 Findings  
identified by  
experts



- Repetition
- Clarifications
- No Relevant



- Experts Request
- Engineering  
Judgement

## 1<sup>st</sup> Topical Peer Review: Workshop Outcomes

- Comments and remarks that fed the TPR report. See conclusions
- Some preliminary findings were screened out during the workshop. Not considered common issues.
- Finally 4 findings were identified:
  - Good Practice: Monitoring of concrete structures.
  - Good Practice: Assessment of inaccessible and/or limited access structures.
  - Expected level of performance: Monitoring of pre-stressing forces.
  - Challenge: Acceptance criteria for the degradation mechanism

## 1<sup>st</sup> Topical Peer Review: Workshop Outcomes

### Monitoring of concrete structures

- Monitoring the concrete structures helps to better predict the mechanical behavior and also verify the analytical models developed.
- The installation of additional instrumentation may compensate for the loss of the sensors.
- The additional instrumentation may measure the same physical parameters as the embedded sensors.

**Good practice: Complementary instrumentation is used to better predict the mechanical behaviour of the containment and to compensate for loss of sensors throughout the life of the plant**

## 1<sup>st</sup> Topical Peer Review: Workshop Outcomes

### Assessment of inaccessible and/or limited access structures

- Ageing of inaccessible structures could potentially lead to severe latent degradation in concrete structures.
- Structural modifications during the life of an NPP may provide opportunities to access formerly inaccessible parts of the structure.
- Regulatory guides to address inspections and monitoring of inaccessible and limited access structures

**Good practice: A proactive and comprehensive methodology is implemented to inspect, monitor and assess inaccessible structures or structures with limited access**



## 1<sup>st</sup> Topical Peer Review: Workshop Outcomes

### Monitoring of pre-stressing forces

- The tendon tension has to be carefully monitored due to its significance for the containment function.
- Whatever the technology, pre-stressing forces should be monitored on a periodic basis to ensure the containment fulfils its safety function

**Expected level of performance: Pre-stressing forces are monitored on a periodic basis to ensure the containment fulfils its safety function**

## 1<sup>st</sup> Topical Peer Review: Workshop Outcomes

### Acceptance criteria for the degradation mechanism

- Both quantitative and qualitative criteria exist
- Some countries reported difficulties in defining objective and comprehensive acceptance criteria for ageing management of concrete structures

**Challenge: It is difficult to define objective and comprehensive acceptance criteria for ageing management of concrete structures. The development of such criteria for a number of degradation mechanisms would improve the effectiveness of the AMPs**

## 1<sup>st</sup> Topical Peer Review: Conclusions

- No major differences in the regulatory basis for safety assessment, and regulatory oversight of concrete containment structures.
- The specific AMPs are generally well established, and result in implementation of periodic monitoring, inspections, testing, surveillance, preventive and corrective maintenance activities of concrete structures.
- Ageing degradation mechanisms for concrete structures are well known and are covered by extensive comprehensive documents.
- Concerning PCPVs, the TPR concluded that the findings mentioned above are also applicable to PCPVs and made no specific findings for PCPVs.
- Concerning research reactors, the review of NARs has found that some AMPs need further development.



European Nuclear Safety Regulators Group

**Thank you for attention**

## **1<sup>st</sup> Topical Peer Review: List of acronyms**

- **AGR- Advanced Gas-cooled Reactor**
- **AMP- Aging Management Program**
- **BWR- Boiling Water Reactor**
- **CANDU- CANada Deuterium Uranium**
- **NAR- National Assessment Report**
- **NPP- Nuclear Power Plant**
- **PCPV- Prestressed Concrete Pressure Vessel**
- **PWR- Pressurized Water Reactor**
- **R&D- Research and Development**
- **SSC- Structures Systems and Components**
- **ToR- Terms of Reference**
- **TPR- Topical Peer Review**
- **TSO- Technical Safety Organization**
- **TS- Technical Specification**
- **VVER- Water-Water Energetic Reactor**