

# BWROG RECOMMENDATIONS FOR SHORT AND LONG TERM RESEARCH

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*BWR Expertise – Proven Solutions*

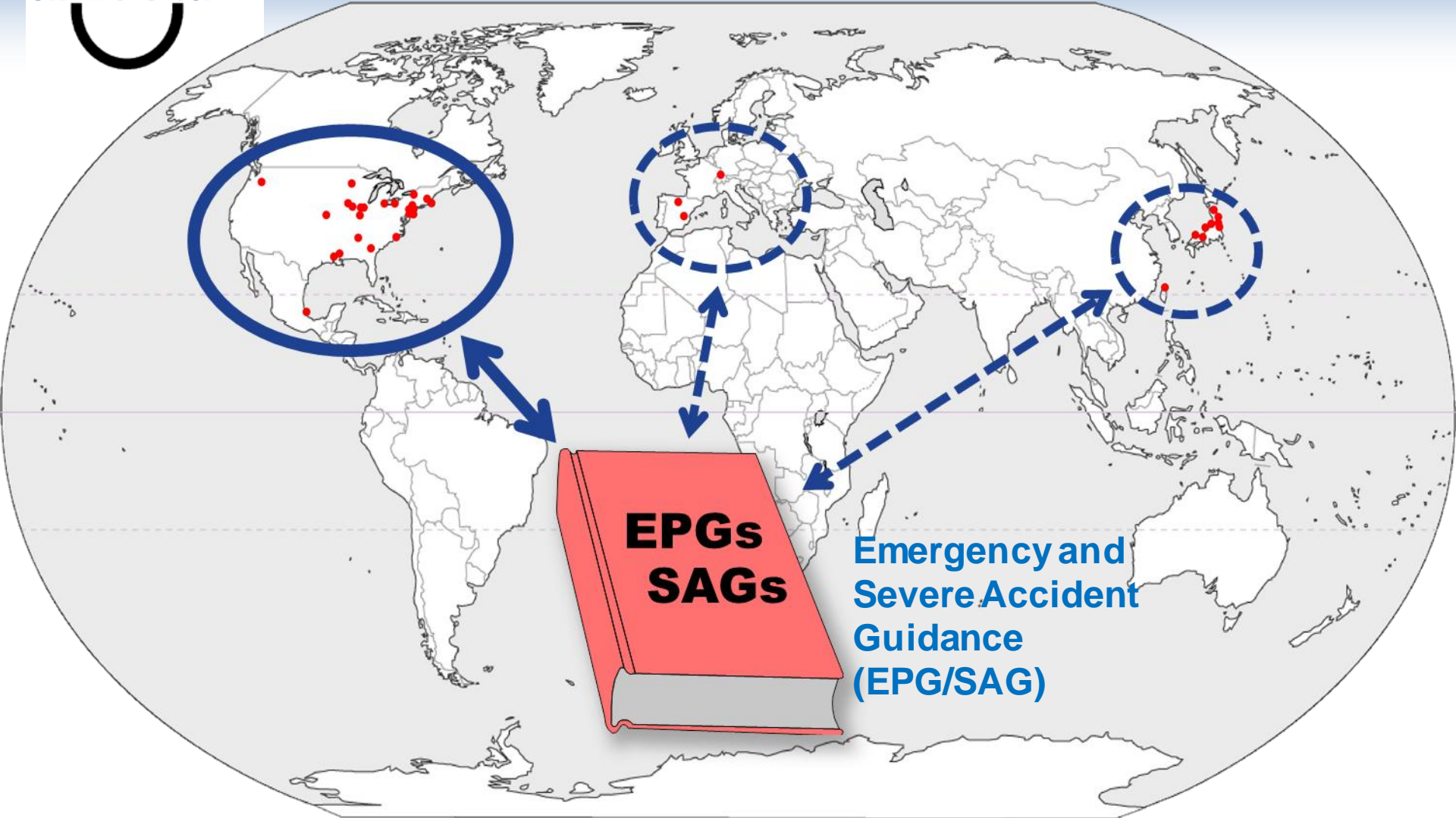
# Introduction



- This presentation highlights BWROG recommendations for short and long term R&D activities focused on fundamental issues that improve plant safety, based on lessons learned from the Fukushima accidents
- The BWR Owners' Group structure and technology committees cultivates continuous learning and improvement at member sites
- BWROG committees pinpoint and address areas where technology improvements enhance plant safety, improve systems, technology and operations



# BWR Owners' Group



# BWROG Objectives



- Share technology & costs to resolve common issues
- Foster joint discussions on operating experience
- Communicate BWROG interests to industry organizations
- Ensure that the BWR design is accurately represented and evaluated



# BWROG Technical Committees



## Regulatory/Risk Committees:

- Interact with regulators for the best interest of the BWR fleet
- Develop leading edge products to implement regulatory guidance and requirements

## Operational Committees:

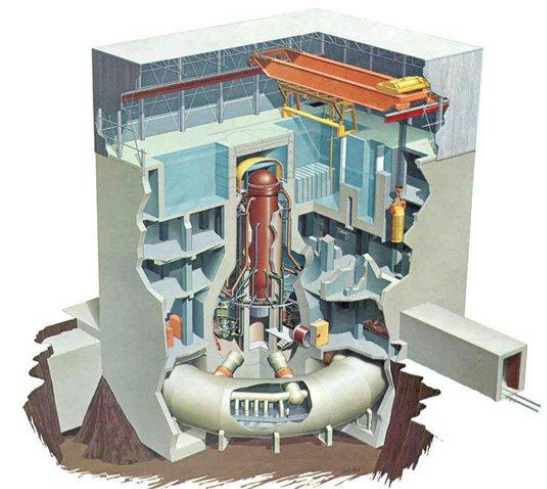
- Review operating history of plants to develop recommendations to reduce scrams and unplanned capacity losses and to improve emergency and severe accident procedures

# BWROG Technical Committees



## System Improvement Committees:

- Use E-mail distribution list to solicit emergent issue support
- Gather unique lessons learned
- Develop best practice guidelines



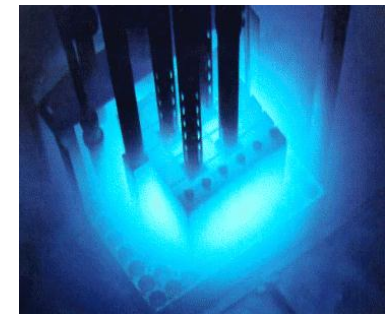
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# PIRT - Potential Issues Review Team



- New issues are brought forward by BWROG Site Representatives, Industry Groups / Regulators, Committee Members or GE-Hitachi
- Emerging issues are reviewed by PIRT every 4 to 6 weeks or more frequently as needed
- PIRT issues are discussed during quarterly BWROG General Meetings
- PIRT issues initially address all plants and are by nature Ad Hoc Committees



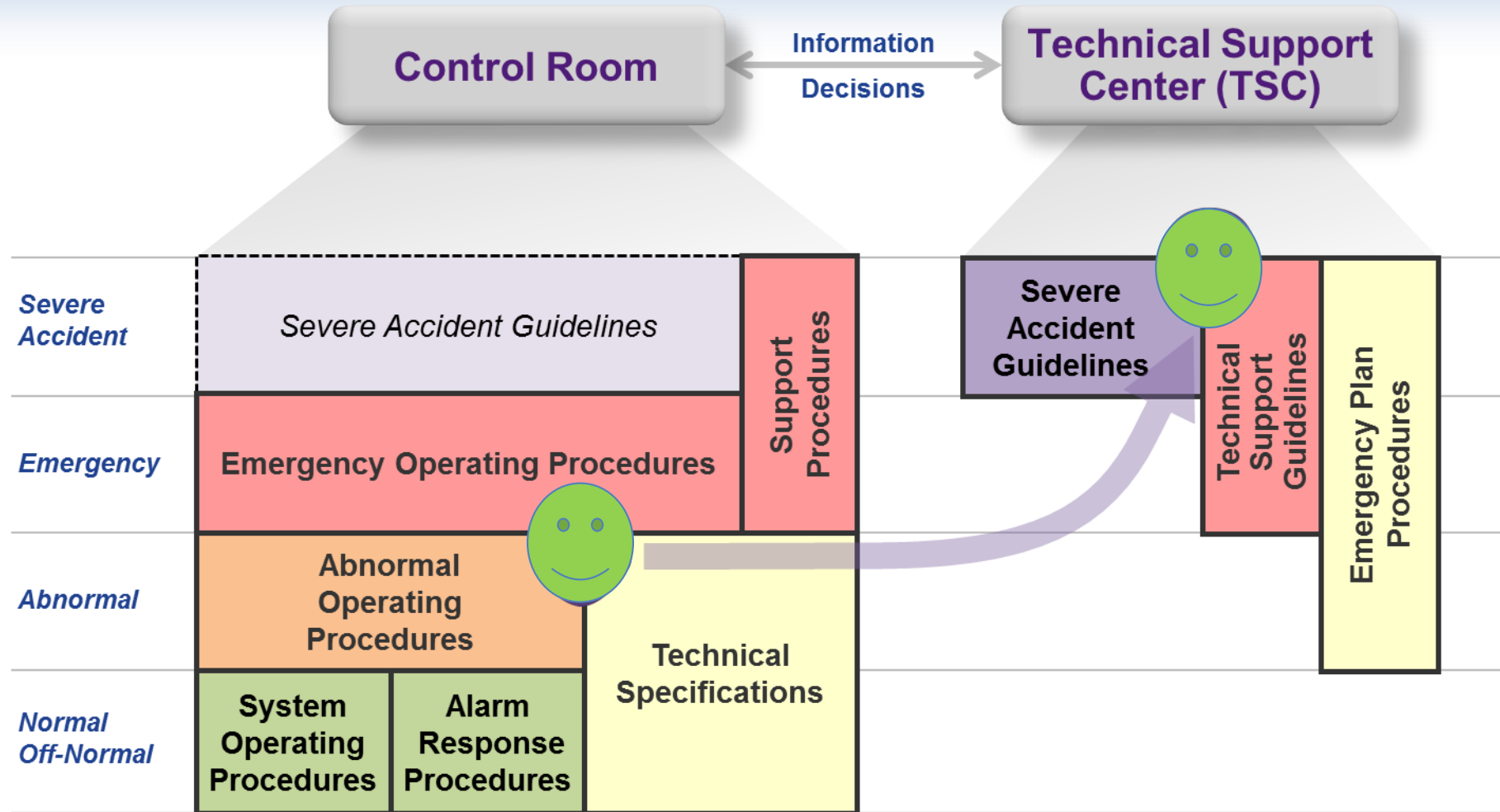
# BWROG – Emergency Procedures Committee (EPC)



- The Emergency Procedure Committee provides a forum for the BWROG members to implement lessons learned from on going safety research programs
- All BWROG members contribute insights into improving generic emergency and severe accident guidelines (EPG/SAGs)
- The BWROG EPG/SAG Guidance has the structure shown on the next slide



# U.S. BWR Procedure Network



# BWROG R&D Recommendations



Short term research *must exist* and focus on resolving current issues that genuinely threaten the viability (safety) of the industry

Noteworthy short term improvements to existing plant safety are obtained through research by:

- The identification of and the optimal use of the existing plant equipment margin established by regulation and design
- Improvements to procedure guidance to use this margin to prevent and mitigate beyond design basis accidents

# BWROG R&D Recommendations



**Accident Prevention** must be the R&D focus (short-term) with ancillary activities designed to mitigate “anything mechanistically possible” (long-term R&D)

Activities in these areas:

- Equipment Qualification
- Materials Performance
- Instrumentation

(that identify and quantify margins and develop procedures to use this margin) have a significant impact on accident prevention in the short term

# Research of Immediate Interest to BWR Fleet Operations



## A. Accident Prevention

### I. Full Scale Testing of RCIC to identify:

- An optimal approach to operate RCIC during ELAP/LOHS (batch or continuous)
- Identify any conditions that lead to self regulation
- Identify RCIC system failure conditions

### II. Analysis:

- Identification of the best transition guidance from steam driven systems to portable equipment
- Interpretation of instrument readings

# Research of Immediate Interest to BWR Fleet Operations



## A. Accident Prevention (Continued)

### III. Materials:

- Identification and use of the existing margin in the 100 °F/hour heatup / cooldown LCO:
  - Provides additional system use options to prevent accident progression

# Fukushima RCIC Observations



Fukushima observations indicated that the RCIC system is more robust than previously credited:

- PRA/PSA and safety studies assume RCIC failure with loss of batteries after 4 to 8 hours – coping times short
- The existing RCIC systems seem capable of extended operation even with loss of DC control (perhaps self regulates)

Demonstrating RCIC (AFW) operation under ELAP/LOHS conditions significantly adds more operations flexibility to mitigate the event (e.g. through full scale laboratory testing)

# Research of Long Interest to - BWR Fleet Operations



## **B. Accident Mitigation**

### Modeling:

Improved understanding of in core severe accident BWR accident progression in particular:

- Identification of the effects of blockage formation between channels on fuel temperature and hydrogen production
- Improved understanding of melt behavior in the lower vessel head and vessel failure conditions

# BWROG R&D Summary



- Short term R&D ***must exist*** and be focused on resolving issues that genuinely threaten the viability (safety) of the industry

Significant short term improvements in safety, operations and systems performance can be obtained by R&D focused on:

- *The identification of and the optimal use of the existing plant equipment margin established by regulation and design along with improvements to procedure guidance to use this margin*



# BWROG Recommendations / Summary

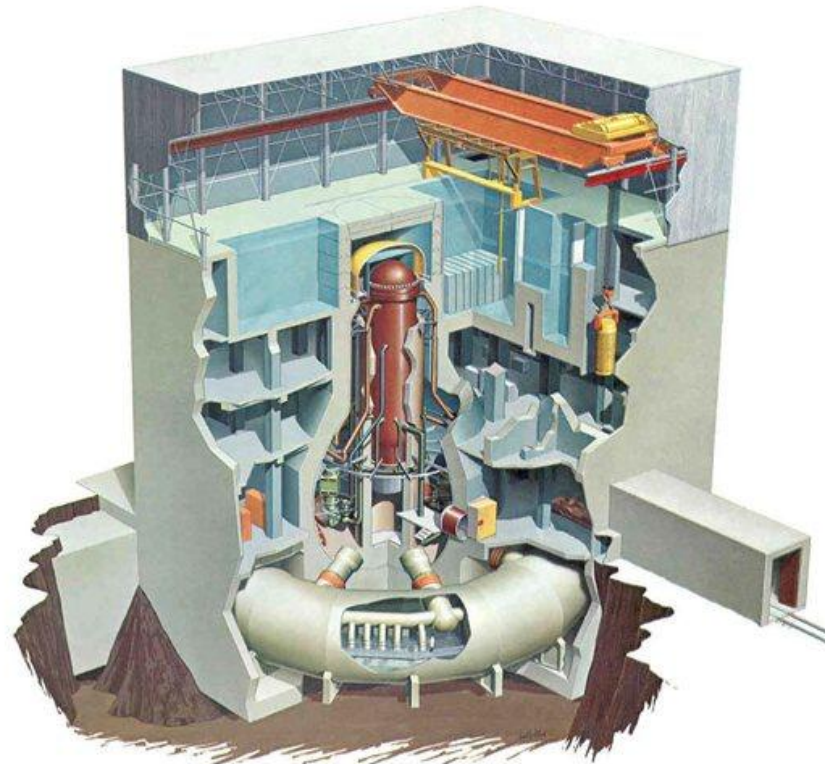


In particular, activities that identify and quantify margins in these areas:

- Equipment Qualification (RCIC ELAP/LOHS Conditions)
- Materials Performance (100 °F/hr margins)
- Instrumentation (interpretation of)

have a significant impact on accident prevention in the short term (< 5 years)

# Questions



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