EPRI Long Term Operations

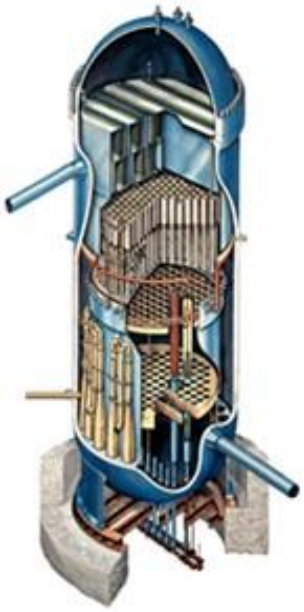
Research & Development for Aging Management

Sherry Bernhoft
EPRI Senior Program Manager

NRC Commissioner Briefing on SLR
April 26, 2017

Technical Basis for Aging Management

Assessment
- What to inspect and when
- Inspection options
- How to dispose any observed degradation



Inspection
- How to inspect
- What equipment and techniques are available
- What are the associated uncertainties
- What techniques need to be improved

Mitigation and Testing
- Prevent or reduced degradation
- Irradiated material testing
- Non-irradiated material testing

Technical Support
- Review of inspection results
- Guidelines review and maintenance

The technical basis for aging management is established, and incorporated in the aging management programs

Over 125 EPRI technical reports are referenced in the SLR GALL

EPRI's Approach

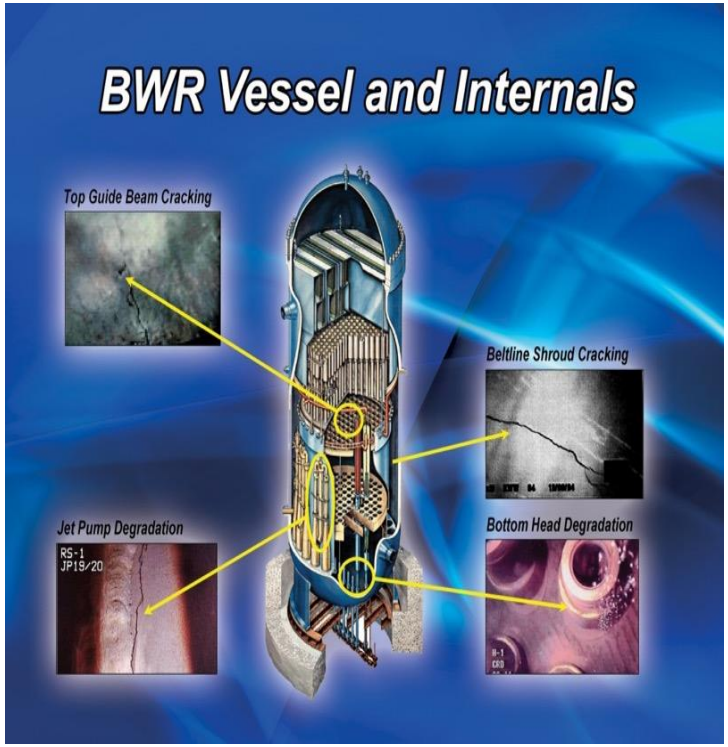
- Issue Management Programs
- Decades of aging management research
- Prioritized research plans
- Collaboration with US DOE, NRC Research and International partners
- NEI Initiative 03-08
- Lead plant support

Living Research Programs

Technical reports are updated based upon:

Four Key Technical Areas

- Reactor pressure vessel neutron embrittlement at high fluence
- Irradiated-assisted stress corrosion cracking of reactor vessel internals
- Concrete degradation
- Electrical cable qualification and condition assessment

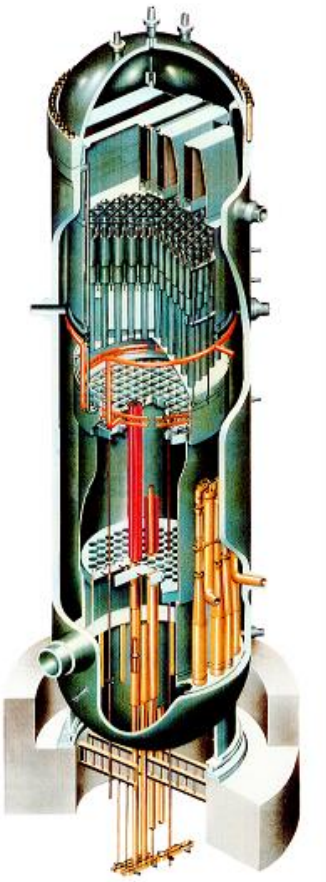


Reactor Pressure Vessels (RPVs)

- Surveillance capsule are used to monitor fracture toughness of the RPV and nozzles due to irradiation and other potential degradation mechanism

- PWRs – Programs to collect surveillance capsule data at higher fluences
  - Coordinated Surveillance Program
  - Supplemental Surveillance Program

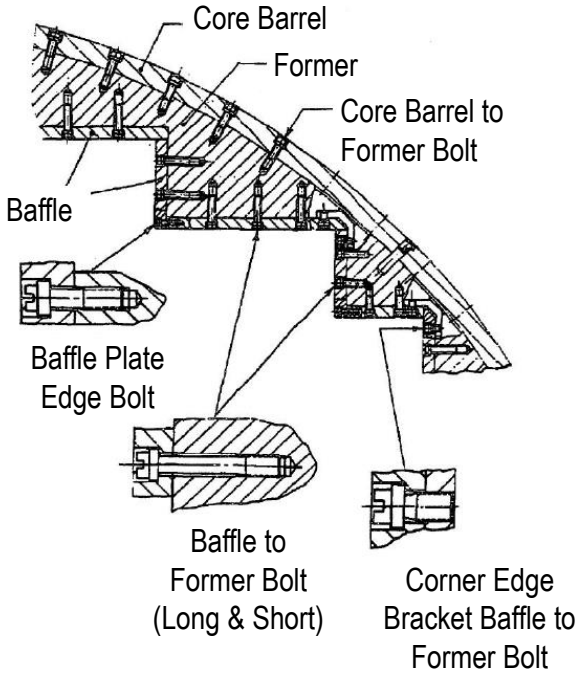
- BWRs – Integrated Surveillance Program
  - Extend for 80 years of operations

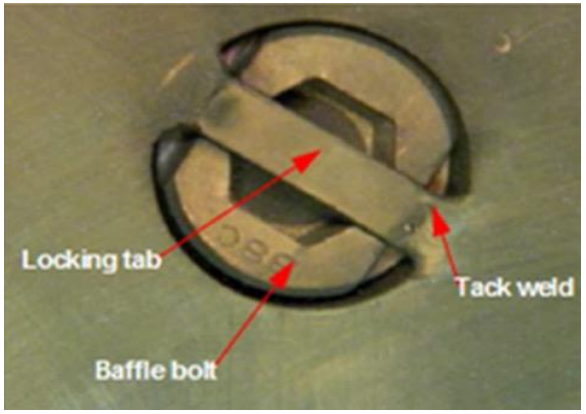


An established embrittlement trend correlations exist to predict RPV mechanical properties

Reactor Vessel Internals

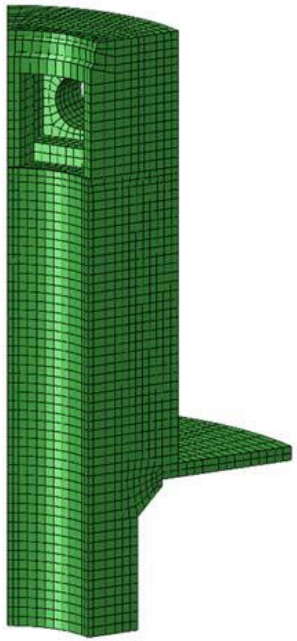
- Irradiation assisted stress corrosion cracking (IASCC) of internals materials due to increased neutron fluence and the operating environment
- EPRI BWR Vessel Internals Program and Materials Reliability Program (PWRs)
- Extensive work has been completed on IASCC initiation and crack growth rate models
- Harvested materials provide confirmation





Concrete Degradation

- Impacts on the structural integrity of concrete due to:
  - Alkali-Silica Reactions (ASR)
  - Irradiation and gamma heating
- EPRI is publishing a series of technical reports on ASR aging management
- Leveraging the irradiated concrete work completed at ORNL, developed a PWR biological shield wall model and published results



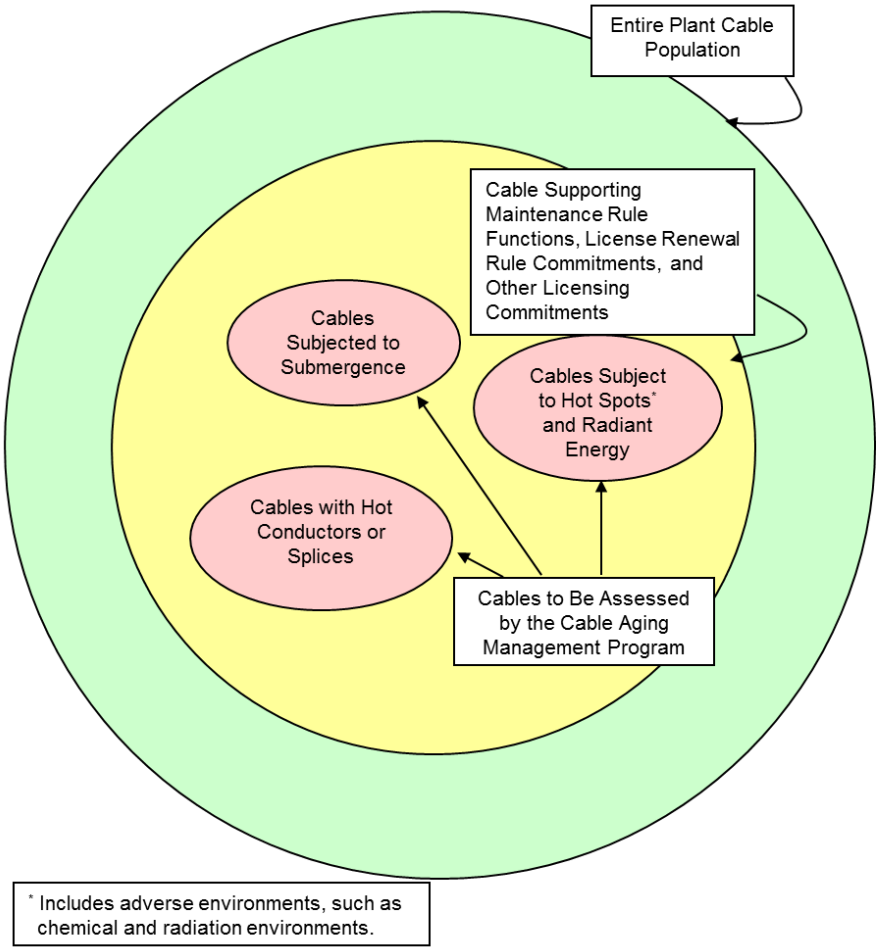
Modeling concrete structures exposed to high levels of radiation demonstrated safety margins exist

Developing aging management and evaluation programs for reactive aggregates

Electrical Cable Qualification and Condition Assessment

- Cable insulation materials age due to radiation, temperature and submergence
- EPRI aging management guidelines for low voltage and medium voltage cables
- Research continues to support asset management
  - Condition monitoring
  - Determine remaining useful life (RUL)

EPRI aging management – scoping methodology



Summary

- Technical basis is established and in use for aging management
- Continuous improvements for aging management are based on research, inspections and operating experience
- Research results and technical reports are shared with the NRC staff
- Technical support for the leads plants

Together…Shaping the Future of Electricity