BWR Vessel and Internals Project Update

Industry / NRC Materials Programs Technical Information Exchange Public Meeting

Steve Richter, Energy Northwest BWRVIP Research Integration Committee Chairman

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August 10, 2021

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Agenda

- Program Status
- Recent BWR Materials Operating Experience
- NRC Interactions
- Open Action Items



Program Status

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2021 BWRVIP Member Utilities



- Tennessee Valley Authority
 - Xcel Energy

Intl

Chubu Electric Power Company – Japan Chugoku Electric Power Company – Japan Comision Federal de Electricidad – Mexico

- Forsmarks Kraftgrupp AB Sweden
 - Iberdrola Generation Spain
 JAPC Japan
- Kernkraftwerk Leibstadt Switzerland
 - OKG Aktiebolag Sweden
 - Tokyo Electric Power Company Japan
 - Taiwan Power Company Taiwan









Technical Committee Responsibilities

Technical Committee	Technical Committee Responsibilities
Assessment	What needs to be inspected, when it needs to be inspected, inspection options, how to disposition observed degradation. Repair/replacement techniques are available including the associated requirements.
Inspection	How to inspect, what equipment and techniques are available, what are the associated uncertainties.
Mitigation	How can SCC degradation be prevented or reduced.
Research Integration	Coordinates overall BWRVIP issue management strategy for resolution of vessel and internals issues



2021 Technical Activities (Major Tasks)

- Further development of a fleet-wide inspection results database and analysis tool that will be used to inform continued maintenance and optimization of BWRVIP inspection and evaluation guidelines
- Development of a core shroud weld PFM evaluation (2021 Technical Report)
- Analysis of core shroud weld off-axis flaw inspection data (2021 Technical Report)
- Initiation of design and fabrication of supplemental surveillance capsules for extension of the ISP for SLR (per BWRVIP-321)
- Development of technical basis on BWRVIP RPV materials aging to inform decisions regarding second license renewal (BWRVIP-316) (2021 Technical Report)



2021 Technical Activities (Major Tasks)

- Updates to chemistry and mitigation guidance and implementation documents (2021 Technical Reports)
- Development of comprehensive leakage evaluation guidance for reactor vessel internals (2021 Technical Report)
- Development of virtual reality tools for BWR IVVI training



Recent BWR Materials Operating Experience

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Recent BWR Materials Operating Experience

- 2021 Greater than expected wear from FAC in a bottom head drain line (BHDL)
- 2020 Identification of a flaw in a LPCI coupling strut to elbow weld
- 2019 No events



BWRVIP Operating Experience – Greater than expected Wear from FAC in a BHDL

- Emergent Issue
 - A domestic BWR/4 identified greater than expected wear in the BHDL during a scheduled FAC exam.
 - The measured wall thickness was initially below the minimum wall calculation which prompted plant staff to communicate issue to the BWRVIP.
 - An updated minimum wall thickness calculation provides sufficient margin for one cycle of operation.
 - BHDL was isolated downstream to stop flow and prevent further wear from occurring.
 - Utility plans to replace the line in 2023.
- BWRVIP response
 - BWRVIP emergent issue protocol invoked.
 - BWRVIP AC and RIC Committee leadership met with EPRI BWRVIP and plant staff to discuss the issue
 - It was determined that the issue did not have generic implications for the industry.
 - Event was communicated to MAPC, BWRVIP RIC, and BWRVIP EOC chair in accordance with emergent issue protocol.
 - EPRI Plant Engineering was also involved in the emergent issues process and will share the information with CHUG



BWRVIP Operating Experience – LPCI Coupling Strut to Elbow Weld Indication

- Emergent Issue
 - A domestic BWR/6 identified an ~1/2" indication in their LPCI coupling strut to elbow weld (unique configuration for BWR/6 design). While the indication was identified in the course of performing BWRVIP exams, it was the first indication found for this location.
- BWRVIP Response
 - BWRVIP emergent issue protocol invoked due to the indication being a first for this inspection location
 - Findings reviewed by BWRVIP Research Integration Committee and determined to be consistent with IGSCC, not significant from a safety perspective, and in a location previously determined to be susceptible to IGSCC
 - Findings communicated to BWRVIP EC Chair, MAPC Chair, and BWRVIP Committees
 - No further actions determined to be needed



NRC Interactions

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Status of BWRVIP Report Submittals

- Recently Received Safety Evaluations
- Recent Approvals of "-A" Reports
- Submittals Still in the Review Process
- Expected 2021 Submittals
- BWRVIP Reports Screened with the NEI 03-08 Screening Process



2021 Safety Evaluations and Approvals of "-A" Reports

 BWRVIP-329, Updated Probabilistic Fracture Mechanics Analyses for BWR RPV Welds to Address Extended Operations, Final NRC SE dated April 12, 2021.

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2021 "-A" Report Submittals

- BWRVIP-321-A: Plan for Extension of the BWR Integrated Surveillance Program (ISP) through the Second License Renewal; Complete – Submitted May 13, 2021
- BWRVIP-329-A: Updated Probabilistic Fracture Mechanics Analyses for BWR RPV Welds to Address Extended Operations; Due October 2021



Submittals Still in the Review Process

- BWRVIP-315, Reactor Internals Aging Management Evaluation for Extended Operations (Submitted 10/22/2019)
 - NRC approved the fee waiver request on 11/26/2019
 - NRC Acceptance of Report for Review received 02/24/2020
 - NRC originally indicated that their new Modified Review Process, but after review decided that the report would need to be reviewed using their standard process
 - Initial RAIs received on 06/04/2020
 - RAI responses provided on 02/15/2021
 - Draft SE was expected by 06/15/2021 but has been delayed



2021 Report Submittals

- Submittal of Reports for Review and Approval:
 - BWRVIP-316, Reactor Pressure Vessel Aging Management Evaluation for Extended Operations (2021 Submittal)
 - Pre-submittal meeting held on March 25, 2020
- Submittals for Information Only:
 - BWRVIP-167, Revision 4, BWR Issue Management Tables (Complete)
 - BWRVIP 2020 Inspection Summary Report (September 2021)



Documents Within the NEI-03-08 Screening Process

- 2020 Screened BWRVIP Documents
 - None
 - No NEI 03-08 Screening Letter to the NRC will be submitted for 2020
- Anticipated 2021 Screened BWRVIP Documents
 - BWRVIP-48, Revision 2 (Vessel ID Attachment Weld Inspection and Flaw Evaluation) – In Committee Review
 - BWRVIP-62, Revision 2 (Technical Basis for Inspection Relief for BWR Internal Components with Hydrogen Injection) – In Committee Review



Open Action Items

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Open Action Items for BWRVIP

- Technical Open Action Items
 - #10 BWRVIP has identified a potential non-conservatism with fracture toughness values for weld materials.
- Management Meeting Open Action Items
 - #4 BWRVIP has identified a potential non-conservatism with fracture toughness values for weld materials.

The following presentation addresses these action items.



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