

MRP-227, Rev. 1 Review and Applicant/Licensee Action Item Closure

Jeff Poehler
Sr. Materials Engineer
Office of Nuclear Reactor Regulation
Jeffrey.Poehler@nrc.gov
(301) 415-8353

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MRP-227, Rev. 1 Review

- 27 RAIs
- RAI responses received on October 16, 2017 and January 30, 2018
- NRC and EPRI MRP held several public meetings to discuss RAI responses.
 - September 6, 2017
 - October 5, 2017
 - February 15, 2018
 - April 23, 2018
- Supplemental/clarifying information related to RAIs discussed during February 15 and April 23 meetings received on May 17, 2018 (MRP Letter 2018-011)

MRP-227, Rev. 1 Review – Major Issues – Core Barrel Weld Coverage

- Westinghouse core barrel and CE core support barrel welds reduction in coverage to 25% of weld length (RAI 5)
- EPRI provided additional information to support this change in January 30 response.
- Staff is reviewing additional information on FMECA and functionality evaluation in MRP Letter 2018-011.
- Due to defense-in-depth considerations, staff is considering whether to include an SE condition requiring a larger extent of coverage.

MRP-227, Rev. 1 Review – Major Review Issues – Baffle- Former Bolts

- Westinghouse baffle-former bolts (RAI 8) – related to consideration of recent OE on higher-than-expected baffle-former bolt degradation in certain plants.
- January 30 response promised to incorporate EPRI interim guidance into MRP-227, Rev. 1
- MRP Letter 2018-011 clarifies meaning of “atypical or aggressive degradation.”
- Staff considering possible condition to ensure plant-specific evaluations of subsequent examination intervals are submitted in a manner consistent with recommendation of staff assessment of EPRI BFB interim guidance.

MRP-227, Rev. 1 Review – Major Issues – Guide Cards

- 10 CFR 21 notification alerted the NRC to a potential significant safety hazard due to guide card wear in four plants that use ion nitrided rod cluster control assemblies (RCCAs) in conjunction with 17x17 A or 17x17 AS style guide tubes.
- In RAI 9 staff asked how MRP-227, Rev. 1 would be modified to address this OE.
- October 16, 2017 response indicated EPRI is revising WCAP-17451-P to address the Part 21, and a markup with note referring to “latest NRC-approved version of WCAP-17451-P”.
- EPRI issued interim guidance for guide cards in scope of the 10 CFR 21 notification on March 23, 2018.
- MRP Letter 2018-011 revised note to refer to WCAP-17451-P, Rev. 1, plus the EPRI Interim Guidance.

MRP-227, Rev. 1 Review - Schedule

- NRC staff is reviewing letter with supplemental information from February 15 and April 23 meetings.
- Draft SE to EPRI MRP expected 3rd quarter 2018.
- Final SE, by end of 2018.

Applicant/Licensee Action Item Closure

- The final SE of MRP-227-A contained eight applicant/licensee action items (A/LAI) that must be addressed by applicants or licensees implementing the topical report.
- Initially, lack of guidance on how to respond to some A/LAI's.
- A/LAI's 1,2,6, and 7 required significant effort by applicants or licensees.
- Both NRC and industry had a desire to minimize A/LAIs in topical report SE's.

Applicant/Licensee Action Item Closure

- NRC and EPRI/PWROG/Westinghouse held several meetings to discuss expectations and generic path for resolution of A/LAI's.
- Industry did significant generic work to resolve A/LAI's.
- NRC has reviewed and documented its assessment of several generic technical reports.
- These reports provide a basis for resolution for several of the action items.

Applicant/Licensee Action Item Closure

- NRC staff issued its safety evaluation:
 - Final Safety Evaluation Of Action Items 1 And 7 From Topical Report MRP-227-A, "Materials Reliability Program: Pressurized Water Reactor Internals Inspection And Evaluations Guideline", January 29, 2018 (ML18016A008)

A/LAI 1 – Plant-Specific Applicability - Background

- Requires an applicants/licensee to demonstrate that MRP-227-A is applicable to its plant.
- After a series of interactions with industry, the NRC determined applicants/licensees could resolve A/LAI 1 by answering the following:
 1. Does the plant have non-weld or bolting austenitic stainless steel (SS) components with 20 percent cold work or greater, and if so, do the affected components have operating stresses greater than 30 ksi? (If both conditions are true, additional components may need to be screened in for stress corrosion cracking, SCC.)”
 2. Does the plant have atypical fuel design or fuel management that could render the assumptions of MRP-227-A, regarding core loading/core design, non-representative for that plant?”

A/LAI 1 – Resolution

- PWROG-15105-NP addresses cold work levels in RVI components – provides basis to conclude no components with cold work >30%. Staff assessment (ML17081A010) complete.
- MRP issued guidance for addressing core design parameters (MRP Letter 2013-025) – now Appendix B to MRP-227, Rev. 1. Staff assessment complete.
- Based on generic guidance reviewed by staff, A/LAI 1 can be closed for applicants/licensees referencing MRP-227-A by meeting the criteria above.
- A/LAI 1 can be resolved by future applicants/licensees submitting plant-specific RVI programs in accordance with MRP-227-A., if the RVI program documents compliance with the criteria of MRP-227-A, Section 2.4, and the core design parameters as defined above.
- MRP-227, Rev. 1 SE will likely contain a similar recommendation.

A/LAI 7 – Plant-Specific Evaluation of CASS RVI Components - Background

- Requires plant-specific evaluation of cast austenitic stainless steel (CASS) components to demonstrate these components will remain functional through the PEO considering the effects of both thermal aging embrittlement (TE) and irradiation embrittlement (IE).
- To screen for TE, licensees need chemical compositions of CASS components. Searches for CMTR's were expensive and time consuming.
- Therefore, industry developed PWROG-15032-NP – "Statistical Assessment of PWR RV Internals CASS Materials"
 - Used available data to determine a statistical upper bound on ferrite content.
 - Additional plant-specific record searches unnecessary.

A/LAI 7 - Resolution

- Only CASS components in scope of A/LAI 7 for Westinghouse and CE plants are the lower support columns (W) and core support columns (CE).
 - Expansion component, difficult to examine.
 - Subject to high neutron fluence.
 - Industry developed a generic functionality evaluation for CSC and LSC – PWROG-14048-P, Rev. 0, PWROG-14048, Rev. 1.
- Staff assessment of PWROG-14048, Rev. 0 found it may be used for guidance in the evaluation methodology. However, plant-specific parameters and conditions need to be used as input into the analytical evaluations.
- NRC staff assessment of PWROG-14048, Rev. 1 agreed report demonstrates:
 - Generic applicability of the methodology of PWROG-14048, Rev. 0 to the W and CE fleet.
 - Likelihood of full-section failure of core support columns is very low.

A/LAI 7 Resolution (2)

- NRC developed revised screening criteria for irradiated CASS
 - supports screening out IE for low-molybdenum CASS components with $\leq 20\%$ ferrite (static cast) or $\leq 25\%$ ferrite (centrifugally cast) that receive < 1 dpa.
 - Documented in Appendix to BWRVIP-234 Final SE (ML16096A002)
 - Consistent with MRP-175 screening criteria for IE of CASS, different technical basis
- B&W CASS Components Subject to A/LAI 7 – NRC staff approved functionality evaluations for four units, one under review, one other licensee has LR commitment to submit.

A/LAI 7 Resolution - Conclusion

- Plant-specific response no longer needed for Westinghouse and CE plants.
 - For lower support columns, in PWROG-14048, Rev. 1, functionality has been demonstrated for PEO.
 - Other CASS components can be screened out based on:
 - PWROG-15032-NP for TE only
 - IE can be screened out for low-moly CASS < 1 dpa based on revised criteria for irradiated CASS.
- B&W functionality evaluations need to be submitted for review and approval, but 4 of 6 units approved to date.
- Similar recommendation expected in MRP-227, Rev. 1 SE.

Other A/LAIs

- A/LAIs 2, 3, 4, 5, 6, and 8 will be addressed in the SE of MRP-227, Rev. 1.
- Other than A/LAI 2, these action items:
 - Have been addressed by licensees already in plant-specific RVI Inspection Program submittals; or
 - Have been determined to have low safety significance by the staff.
- It is likely that all these A/LAIs except A/LAI 2 will not be retained by the SE of MRP-227, Rev. 1
- A/LAI 2 pertains to plant-specific RVI components. Will likely still be included in some form in MRP-227, Rev. 1.

A/LAI 2 – Identification of Plant-Specific Components

- Requires applicants and licensees to identify any plant-specific RVI components that were not addressed by the generic screening, FMECA, functionality, and aging management recommendations of MRP-227-A.
- Also extends to components with same configuration, but different materials than the generic component in MRP-227-A.
- Plant-specific RVI Inspection Plans following MRP-227-A have found few if any plant-specific components that required changes to the aging management activities.
- EPRI added additional wording to MRP-227, Rev. 1 Section 2.4 to address the need to identify plant-specific differences.
- NRC is considering whether to include A/LAI 2 requiring inclusion of A/LAI 2 information in the RVI Program, including FMECA and aging management recommendations, in MRP-227, Rev. 1 SE.