

# Overview of Preliminary Approach on MRP-227, Revision 1 Requests for Additional Information

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## Overview

- Final requests for additional information were received on May 15, 2017 (ADAMS Accession No. ML16154A063)
- Target response date is September 27, 2017
- Response strategies/approaches here are **DRAFT,**  
**PRELIMINARY,** and for discussion only

## RAI 5 – W/CE Core Barrel Weld Coverage (1-4 of 5 Parts)

- Provide a technical justification for the reduction in the required examination coverage from 100 percent (minimum 75%) to 25 percent, for the component items listed in Table 1. If the technical justification relies in whole or part upon a statistical analysis, provide the detailed statistical analysis. The technical justification for the reduction in examination coverage should provide reasonable assurance that (1) the functionality of the core barrel will be maintained and (2) the structural integrity of the core barrel will be maintained to ensure safe shutdown of the reactor during the period of extended operation (PEO).
- Clarify whether the justification for reduction in the required examination coverage relies on the assumption that licensees will perform a plant-specific determination of the most likely portion of the weld to experience cracking.
- Discuss how it can be assured that the 25 percent sample of each weld examined will be selected based on an evaluation of the most likely accessible portion of the weld to exhibit cracking, since Table 4-2 and 4-3 do not require such an evaluation.
- Discuss how the proposed 25 percent sample examination coverage accounts for the possibility of cracking initiating on the opposite side of the weld from the side examined or in a portion of the component that is inaccessible.

## RAI 5 – Core Barrel Weld Coverage (1-4 of 5 Parts)

- Preliminary Industry approach:
  - Statistical arguments already presented in MRP-227 Section 4.3 are still valid
    - Arguments are based on MRP-227 aging management being a sampling strategy
    - Inspections are being conducted across fleet, thus increasing quantity of OE
    - If issues are identified during exams, industry will adjust guidance as appropriate
  - Pressurized Water Reactor Owners Group (PWROG) project is underway to evaluate the effects of core barrel weld failures and the resulting safety impact
    - Reactor design features limit vertical displacement and maintain engagement with control rods
    - Design feature already described in (most) FSARs
    - Intent is to assess potential impact with completely severed core barrel weld
  - Evaluation will be made available to NRC when complete in mid-2018

## RAI 5 – Core Barrel Weld Coverage (5<sup>th</sup> of 5 Parts)

- For C5., “Core Support barrel Assembly Upper Flange Weld (UFW),” clarify whether 25 percent of both sides of the weld are to be examined. If both sides are to be examined, explain the inconsistency with W3. Core Barrel Assembly UFW, for which MRP-227, Rev. 1 only requires one side to be examined.
  - Preliminary Industry approach: These coverage requirements should be consistent. The text of C5 in Table 4-2 will be updated to match the text for W3 and require inspection of one side.

## RAI 7 – Core Barrel Assembly LGW Inspection Coverage

- For all the welds listed in Table 1 except for Item W4., “Core Barrel Assembly – Lower Girth Weld (LGW),” the examination acceptance and expansion criteria in Table 5-2 and Table 5-3 require the inspection coverage to be extended to include 100% of the accessible length of the weld during the same refueling outage, if there is confirmed detection of a surface breaking linear indication in that weld. Should this expansion also be applied to Item W4? If not, provide a technical justification.
  - Preliminary Industry approach: Agree there should be a requirement to expand the coverage on this weld similar to the other core barrel welds. This will be changed to make the expansion criteria for the remainder of the LGW consistent.

## **RAI 8 – Baffle-Former Bolts (Parts a, b, c, and e)**

- a) Discuss whether revised guidance for BFB needs to be incorporated into MRP-227, Rev. 1. If not, why not?
  - b) If such guidance should be incorporated, provide specifics on the initial examination coverage and schedule, and on how the subsequent examination coverage and timing would be determined.
  - c) Considering the recent OE with BFB degradation, justify that a ten-year subsequent examination interval remains appropriate for BFB. This justification should consider the possible effects of clustering.
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- **Preliminary Industry Approach: The interim guidance will be incorporated within the MRP-227 Rev.1 via SER RAI process**

## RAI 8 – Baffle-Former Bolts (Part d)

- d) How will the schedule for subsequent examination be determined if examination results show that greater than 50 percent of the numerical margin of bolts is degraded?
  - e) Provide a justification that the criteria allowing subsequent examination of BFB may be performed in ten years, provided 50 percent or less of the numerical margin of BFB is degraded, is still appropriate considering the discovery of clustering of degraded BFB, and the discovery of more extensive BFB degradation than expected.
- Preliminary Industry Approach: WCAP-17096-NP-A is still the applicable document
    - A PWROG project will update the WCAP-17096-NP-A guidance, including updating the baffle-former bolt acceptance criteria
    - Exceeding the allowed margin would require a plant to either perform a plant-specific evaluation or address the issue through another path (e.g., replacements)
      - Use existing methodologies (e.g. acceptable bolting patterns) for structural acceptance
      - Level of evaluation commensurate with level of degradation and available margins



## **RAI 9 – Reduced Coverage for the CE Core Support Columns and Westinghouse Lower Support Column Bodies (Parts a and b)**

- a) Justify the required coverage of 25 percent as visible from above the core plate for Item C8 and W4.4 is sufficient to provide reasonable assurance of functionality.
- b) Justify the use of VT-3 examination instead of EVT-1 to detect cracking.

### **Preliminary Industry Approach:**

- Parts A and B will utilize the evaluations in PWROG-14048 “Functionality Analysis: Lower Support Columns”. PWROG-14048 evaluated the likelihood of a functionality loss in the columns. (PWROG-14048 Rev.1 was provided to staff)
- General visual inspection via VT-3 is sufficient to confirm component functionality

## **RAI 9 – Reduced Coverage for the CE Core Support Columns and Westinghouse Lower Support Column Bodies (Part c and d)**

- c) Clarify the meaning of “25% of column assemblies as visible using a VT-3 examination from above the lower core plate.” Does this mean that 1) only 25 percent of the total number of columns visible need to be inspected, 2) 25 percent of the total number of columns (visible and not visible) must be examined to claim credit for the examination, or that 3) 25 percent of the total columns should be inspected if this number is visible? Should all columns visible from above the core plate be examined, or just enough to constitute 25 percent of the total population (visible plus not visible).
  - **Preliminary Industry Approach:** Intent of this examination coverage is consistent with option 2 in the question: 25% of the total number of columns (visible and not visible) must be examined to claim credit for the examination, but the examination will be conducted from above the lower core plate and only those parts of the columns that are visible from above the plate with a VT-3 inspection are included in the coverage requirement.
- d) What expansion of the examination scope to the remaining columns will be conducted if degradation is observed in the 25 percent sample?
  - **Industry Approach:** This will be changed to add the expansion criteria.

## **RAI 9 – Reduced Coverage for the CE Core Support Columns and Westinghouse Lower Support Column Bodies (cont.)**

- e) For CE-design RVI, explain why examination of the core support columns is specified only for plants with full-height bolted shroud plates and not for plants with core shrouds assembled in two vertical sections.
  - Preliminary Industry Approach: The current applicability in MRP-227, Revision 1 is “Plants with full-height bolted or half-height welded core shroud plates”. The half-height welded shroud plates correspond to those plants with core shrouds assembled in two vertical sections.
- f) Explain why the core support columns are a Primary component for CE plants but the component in Westinghouse plants with the same function (lower core support columns) is an Expansion component.
  - Preliminary Industry Approach: PWROG-14048 Rev.1 provides a basis for both components to be Expansion items. MRP-227 Rev.1 was published before this, and the CE core support columns were originally included in MRP-227-A as a Primary component and were left as Primary in MRP-227 Rev.1.
  - Industry believes that CE core support columns should be Expansion

## RAI 10 – Examination Coverage of Deep Beams and Lower Core Support Beams

- Provide a justification for the reduction in coverage for these two items. The technical justification for the reduction in examination coverage should provide reasonable assurance that (1) the functionality of the components will be maintained and (2) the structural integrity of the components will be maintained to ensure safe shutdown of the reactor during the PEO.
  - Preliminary Industry Approach: Clarify that the 25% sample is the top 25% of the welds, closest to the core. This is where the accumulated dose is highest.
  
- What expansion to the remaining beam-to-beam welds will be conducted if degradation is found in the initial 25 percent inspection sample?
  - Preliminary Industry Approach: This will be changed to add the expansion criteria.

## RAI 12 – Remaining Axial Welds and Ribs and Rings Examination Coverage

- a) For Item C2.1 and 3.1, does 75 percent of the remaining axial weld length for the remaining axial welds mean a minimum of 75 percent of the total accessible plus inaccessible length of these welds must be examined to claim examination credit?
  - Preliminary Industry Approach: This means that 75% of the un-inspected weld length that is visible on the core side of the shroud must be examined. This is the high fluence side of the weld.
- b) Justify the 25 percent sample size for the ribs and rings (Item C3.2).
  - This question is superseded by the response to part c of this question
- c) Clarify whether the ribs and rings are accessible for visual examination.
  - Preliminary Industry Approach: The ribs and rings are not accessible given current inspection capabilities.

## RAI 13 – Operating Experience

1. In MRP-227, Rev. 1, has OE been used to modify or clarify examination coverage requirements of MRP-227-A based on the actual accessibility achieved during the examinations completed to date? If so, identify the components that have had examination coverage revised based on OE, and describe the reason for the change. If coverage requirements have not been revised based on OE, justify why this has not been done.
  - Preliminary Industry Approach: Components that have been inspected that provided information on accessibility during inspections will be listed along with effects on the coverage requirements
2. Has OE with actual coverage achieved resulted in any primary component that was previously considered to be accessible being reclassified as inaccessible, either because of the percentage of the component surface area, length, or population that is accessible was insufficient to provide reasonable assurance of functionality, or because insufficient coverage was achieved of the most likely portion of the component to exhibit degradation? Identify any primary components that have been reclassified as inaccessible and identify what alternate measures, such as an engineering analysis, were taken to provide reasonable assurance of component functionality.
  - Preliminary Industry Approach: OE to-date has not resulted in the reclassification of a component as inaccessible.

## RAI 13 – Operating Experience (cont.)

3. For primary components reclassified as inaccessible, were the expansion links reevaluated for these components?
  - Not Applicable
4. For any primary components reclassified as inaccessible, were alternate primary components selected?
  - Not Applicable

## RAI 14 – Upper Core Plate and the Lower Internals Assembly & Lower Support Forging or Casting Examination

- a) Justify the use of VT-3 examination for these components;
- b) Justify the reduction in examination coverage from 100 percent to 25 percent. The technical justification for the reduction in examination coverage should provide reasonable assurance that (1) the functionality of the components will be maintained and (2) the structural integrity of the components will be maintained to ensure safe shutdown of the reactor during the PEO.
  - Preliminary Industry Approach: The upper core plate coverage is reduced because there is a low probability that any cracks would propagate through the structure. VT-3 exam is appropriate for general condition inspection.
  - The lower support forging or casting is attached to the core barrel through the core barrel lower flange weld (LFW). The LFW is already an expansion from the same Primary item (UFW). The LFW is the leading component for aging management on the lower support structure (weld, geometry, stress).
- c) Is it intended that if the examination of the 25 percent sample of these items reveals indications, the examination coverage will be expanded to include the remaining accessible surfaces of these components? If not, why not?
  - Preliminary Industry Approach: This will be changed to add the expansion criteria.



## RAI 15 – Guide Tube Support Pins (Split Pins)

- a) Clarify if type 316 stainless steel split pins require a plant-specific aging management program, or whether they are a “no additional measures component.” Modify the wording of section 4.4 of MRP-227, Rev. 1 as necessary.
  - Preliminary Industry Approach: Type 316 SS split pins were ranked as Category A in MRP-191 as compared to Category C for X-750 split pins. Thus, they were assigned to the “no additional measures” category.
- b) Discuss whether it would be appropriate to include a requirement in MRP-227, Rev. 1 that the specific aging management program for split pins be documented in the plant-specific RVI program, including the replacement and/or inspection schedule, replacement material, examination method and coverage, technical basis for the replacement schedule or the remaining life of the split pins (if already replaced), and technical basis for the inspection schedule or lack of inspections.
  - Preliminary Industry Approach: For Type 316 SS split pins, the categorization as “no additional measures” would not require the inclusion of such a requirement in MRP-227, Revision 1. The few remaining plants that have X-750 split pins are already covered by the note in Section 4.4 that states that the plant owner should review its specific design, upgrade status, and asset management plans.

## RAI 16 – Components Subject to Fatigue Screening

- a) Define and justify the criteria that are to be used for screening for fatigue. Is a specific cumulative usage factor (CUF) value used as a screening criterion? Are environmental effects to be considered? If so, how are environmental effects to be included in the evaluation? EPRI should also discuss whether such a criterion should be added to Table 4-2.
  - Preliminary Industry Approach: The fatigue screening criterion that is provided in MRP-175, Revision 0 and was used in the development of MRP-227-A will be applied. MRP-175, Revision 0 provides a screening CUF of 0.1 at 40 years, which was intended to address potential environmental effects.
- b) Justify how fatigue screening accounts for possible SCC contributions for Item C.7 CSBFW? Is additional evaluation or inspection of the CSBFW needed to address possible SCC?
  - Preliminary Industry Approach: Fatigue screening is independent of SCC screening.

## RAI 19 – Guide Card Wear

- Discuss how MRP-227, Rev. 1 and/or WCAP-17451-P, Rev. 1 should be modified to address the OE discussed in the 10 CFR Part 21 notification related to guide cards (Ref. 9).
  - Preliminary Industry Approach: MRP-227, Revision 1 currently references WCAP-17451-P, Revision 1 for the guide card Primary inspection requirements. A PWROG program is currently in progress to evaluate the most recent OE and revise WCAP-17451-P, Revision 1. A reference to the most current revision of WCAP-17451-P will be incorporated to MRP-227 in order to address this 10 CFR Part 21 notification and the Westinghouse NSAL-17-1.

## RAI 20 – Welded Items – Adjacent Base Metal to be Examined

- Define what extent of the adjacent base metal must be examined (e.g., a certain distance from the weld fusion line or centerline).
  - Preliminary Industry Approach: This question is addressed in Section 4.2.2 of MRP-227, Revision 1

## RAI 23 – Core Shroud Assembly (welded) – Assembly Inspection Technique

- Clarify whether VT-1 or VT-3 is the intended technique. If VT-3 is the intended technique, explain why this technique is acceptable to address the amount of physical separation expected if distortion is occurring.
  - Preliminary Industry Approach: This appears to be a typographical error. The inspection method requirement in Table 5-2 should align with the inspection technique specified in Table 4-2, which is VT-1.

## RAI 24 – Lower Core Support Beams Inspection Time Frame

- What is the technical basis for changing the time frame for the expansion inspection of the lower core support beams to within the next three refueling cycles?
  - Preliminary Industry Approach: The technical basis comes from the relative MRP-191 FMECA grouping and categorization and on the geometric and location differences between the beams and the core barrel (e.g., there are multiple beams, the loading is different, etc.)

## RAI 26 – Reclassification of Welds

- a) Justify reclassifying the UGW and LGW from Primary to Expansion.
  - Preliminary Industry Approach: Previous naming and degradation mechanism assignment was confusing (e.g., upper and lower core barrel cylinder girth welds were assigned SCC, IASCC, and fatigue when only the MGW was subject to IASCC)
  - In MRP-191 Rev.1, more details on the exact locations of the welds clarified what the radiation levels and relevant aging mechanisms would be (SCC versus IASCC).
  - According to the lead component approach it makes sense to only inspect the lead weld for each degradation mechanism (UFW for SCC and fatigue; MGW for IASCC and fatigue)
- b) Justify making the UAW a “secondary expansion” to the UGW and LFW.
  - Preliminary Industry Approach: Discuss that the axial welds are not as strongly loaded and they have less of a functional effect if they do crack
- c) Justify reclassifying the LFW from Primary to Expansion. Explain why the LFW classification is not consistent with the analogous CE component, the CSBFW, which is classified as Primary.
  - Preliminary Industry Approach: The design differences will be discussed. This CE CSBFW weld is expected to be more susceptible to degradation and remained primary.

## RAI 27 – Omitted Information in Section 7.3 of MRP-227

- Justify the basis for omitting these paragraphs from the scope of Section 7.3 of the MRP-227, Revision 1 report.
  - Preliminary Industry Approach: This was omitted because key parts of the previous text, such as the requirement to provide a technical justification for a deviation from a Needed or Mandatory Requirement or the contents of the NEI 03-08 Implementation Protocol, are included by reference to NEI 03-08.





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