

Draft Generic Aging Lessons Learned (GALL) Report and Standard Review Plan (SRP) for Subsequent License Renewal (SLR)

Mechanical Aging Management Programs (AMPs)

**Office of Nuclear Reactor Regulation
Division of License Renewal**

June 23, 2016

Agenda

Opening Remarks

Comments on Mechanical Sections

- Discussion will mostly focus on comments that were partially accepted or not accepted
- The final disposition of comments received on the draft SLR guidance documents, including the supplement, will be documented in a technical basis NUREG

Agenda

Time	Discussion Topic
01:00PM-01:05PM	<ul style="list-style-type: none"> Opening Remarks
01:05PM-01:45PM	<ul style="list-style-type: none"> AMP XI.M11B, Cracking of Nickel-Alloy Components and Loss of Material Due to Boric Acid-Induced Corrosion in Reactor Coolant Pressure Boundary Components (Pressurized Water Reactors Only) – staff to present its final disposition of BMI nozzle examinations
01:45PM-02:30PM	<ul style="list-style-type: none"> Projected degradation through the subsequent period of extended operation – staff to discuss the AMPs that were determined to need modifications to include guidance for projecting degradation throughout the subsequent period of extended operation Comments on AMPs XI.M36, External Surfaces Monitoring of Mechanical Components, and XI.M38, Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components – staff to provide clarity on the term “demonstrated” for evidence that cracks were detected by visual examination
02:30PM-02:45PM	<ul style="list-style-type: none"> Reactor Coolant Pressure Boundary Definition – staff to present an addition of definition to the Standard Review Plan for Subsequent License Renewal
02:45PM-03:00PM	<ul style="list-style-type: none"> AMP XI.M18, Bolting Integrity – staff to indicate if the AMP will be modified to clarify whether it requires inspection of all safety-related and nonsafety-related bolts
03:00PM-03:30PM	<ul style="list-style-type: none"> SRP-SLR Section 4.2, Reactor Pressure Vessel Neutron Embrittlement Analysis – staff to present its initial disposition of comments Cross-cutting Issue related to SRP-SLR Sections 1.1.5, 2.1.5, 2.2.5, 2.3.5, 2.4.5, 2.5.5, 3.1.5, 3.2.5, 3.3.5, 3.4.5, 3.5.5, 3.6.5, 4.1.5, 4.2.5, 4.3.5, 4.4.5, 4.5.5, 4.6.5, 4.7.5 GALL-SLR Chapter IV, Reactor Vessel, Internals, and Reactor Coolant System and SRP-SLR Section 3.1, Aging Management of Reactor Vessel, Internals, and Reactor Coolant System – staff to present its initial disposition of comments AMP XI.M5, Boiling Water Reactor (BWR) Feedwater Nozzles – staff to present final disposition to delete AMP
03:30PM-04:00PM	<ul style="list-style-type: none"> AMP X.M1, Fatigue Monitoring – staff to present its disposition of remaining comments AMP X.M1, Fatigue Monitoring – industry to provide comments on staff’s disposition of AMP
04:00PM-04:30PM	<ul style="list-style-type: none"> AMP XI.M31, Reactor Vessel Material Surveillance – staff to discuss the disposition of comments
04:30PM-04:50PM	<ul style="list-style-type: none"> Questions from the Public
04:50PM-05:00PM	<ul style="list-style-type: none"> Closing Remarks, Action Items, Adjourn



Balance-of-Plant Sections

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Projected Degradation

Updates to Acceptance Criteria and Corrective Actions Program Elements for Projected Degradation

Industry Comment – Not applicable

Staff Response – Staff seeks discussion

Technical Basis

- AMPs are inconsistent in addressing acceptance criteria in relation to potential future degradation
- AMPs are inconsistent in regard to addressing associated corrective actions
- Not all AMPs will be revised (e.g., ASME Section XI, Flow Accelerated Corrosion)

Projected Degradation, cont.

Summary of Staff Recommendations

- One-time program with 100% inspection:
 - Project the degree of observed degradation, where practical, to the end of the subsequent period of extended operation
 - Applicant enters in corrective actions program
 - Multiple instances result in a periodic program
- One-time program with sampling-based inspection:
 - Project the degree of observed degradation, where practical, to the end of the subsequent period of extended operation
 - AMP will recommend additional inspections when the acceptance criteria are not met
 - Multiple instances result in a periodic program
- Periodic program with 100% inspection:
 - Project the degree of observed degradation, where practical, to the end of the subsequent period of extended operation or the next scheduled inspection, whichever is shorter
 - Applicant enters in corrective actions program

Projected Degradation, cont.

Summary of Staff Recommendations, cont.

- Periodic program with sampling-based inspection:
 - Project the degree of observed degradation, where practical, to the end of the subsequent period of extended operation or the next scheduled inspection, whichever is shorter
 - Depending on the potential consequence of not meeting the acceptance criteria or the periodicity of inspections (e.g., every 10 years versus every refueling outage) for the specific program, the “corrective action” program element should include recommendations related to additional inspections
- “Where practical”
 - Not all degradation is quantifiable
 - Qualitative acceptance criteria are allowed
 - Staff would not necessarily expect that a volumetric examination would be conducted after a recommended visual or surface exam
 - Staff will document this in the GALL-SLR Basis document

Projected Degradation, cont.

Potentially Affected AMPs		
XI.M10 – boric acid	XI.M33 – selective leaching	XI.S7 – water-control structures
XI.M18 - bolting	XI.M36 – external surfaces	
XI.M20 – open cycle	XI.M37 – flux thimble tubes	XI.E1 – cable insulation
XI.M21A – closed cycle	XI.M38 – internal surfaces	XI.E2 – instrument insulation
XI.M26 - boraflex	XI.M41 – buried components	XI. E3A – inaccessible medium voltage cable
XI.M27 – fire water	XI.M42 - coatings	XI.E3B – inaccessible instrument cable
XI.M29 - tanks		XI.E3C – inaccessible low voltage cable
XI.M30 – fuel oil	XI.S5 – masonry walls	XI.E4 – metal enclosed bus
XI.M32 – one-time	XI.S6 – structures monitoring	XI.E6 – cable connections

Attachment 4: Comment Nos. XI.M36-3 and XI.M38-4

AMP XI.M36 & XI.M38 Surface Examinations

Industry Comment

- XI.M36-3: remove recommendation for periodic surface examinations
- XI.M38-4: remove recommendation for periodic surface examinations

Staff Response – Not Accepted; however, recommendation was modified

- Modification allows one of three options:
 - Surface examination
 - VT-1 (including non-Code components)
 - Analytical path
 - Determine maximum size crack that would meet structural integrity
 - Determine if leak rate would be large enough to detect
 - Water-filled systems
 - Gas-filled systems

Attachment 4: Comment Nos. XI.M36-3 and XI.M38-4. cont.

Technical Basis

- The staff recognizes that AMPs XI.M36 and XI.M38 were based upon visual inspections principally conducted by system engineers and craft, respectively.
- Cracks might not be detected by visual techniques, particularly system engineer walkdowns.
- VT-1 inspections ensure certain inspection parameters are met (e.g., lighting, distance).
- The inspections for cracking are sampling-based (e.g., 25 inspections).

QUESTIONS



Reactor Coolant Pressure Boundary Definition

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SRP-SLR Intended Function in Table 2.1-4(b)



Reactor Coolant Pressure Boundary

Notwithstanding the allowances within plant specific technical specifications (e.g., steam generator tube leakage, unidentified leakage), provide a pressure retaining leak-tight boundary and deliver sufficient flow at adequate pressure to reactor coolant system components.

10 CFR Part 50, Appendix A, General Design Criterion 32:

Inspection of reactor coolant pressure boundary. Components which are part of the reactor coolant pressure boundary shall be designed to permit (1) periodic inspection and testing of important areas and features to assess their structural and leak-tight integrity, and (2) an appropriate material surveillance program for the reactor pressure vessel.

QUESTIONS



AMP XI.M18, Bolting Integrity

**Office of Nuclear Reactor Regulation
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Bolting Inspections

Industry Comment

Modify AMP to clarify whether inspections are recommended on all safety-related and nonsafety-related bolts.

Staff Response – Accepted

Technical Basis

It was not the staff's intent to imply that 100% of the bolts are inspected.

Summary of Staff Recommendations

A sentence will be added to the program description stating that the AMP is a sampling-based program that is not intended to imply 100% inspection of all in-scope bolts.

QUESTIONS



SRP-SLR Section 4.2, Reactor Pressure Vessel Neutron Embrittlement Analysis

**Office of Nuclear Reactor Regulation
Division of License Renewal**

Comment from ML16049A580

Industry Comment

Draft report states: With regards to sections 4.2.2.1.3 (page 4.2-3), 4.2.1.1.5 (page 4.2.5), 4.2.1.1.6 (page 4.2-6), 4.2.3.1.5 (page 4.2-13) and 4.2.3.1.6 (page 4.2-13) the draft standard review plan for subsequent License renewal (NUREG-2192) cites phrases "Approved technical alternatives for SLR have yet to be developed. They will be evaluated on a case-by-case basis to ensure that the aging effects will be managed in accordance with 10 CFR 54.21(c) (1)"

Action (1): This sentence highlighted in italics appearing in the cited sections in Standard Review [P]lan - Subsequent License [R]enewal (SLR) (NUREG-2192, Docket ID: NRC-2015-0251) needs to be removed or rephrased to give the guidance some clarity and unambiguity.

Comment from ML16049A580

Industry Comment, cont.

Comment: This carries from the original Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants (SRP-LR) (NUREG-1800) published in 2001. Specifically, in dispositioning licensee's renewal applications the staff generally accept applicant's plant specific analysis for TLAAs based on real-time fluence data from capsules removed from reactor and dosimetry measurements projected through effective full power years to satisfy licensing bases for the renewal periods or using EMAs and accepting other justification as to how they satisfy requirements of 10 CFR 10 CFR 54.21(c) (1)(i) thru (iii). This is a standard routine and a universally accepted procedure. So this being the current status of these reviews, unless staff have a specific reason, have other legal objections, or actually working on alternatives, it is suggested that it is time to remove the phrase from the SRSLR. The SRP-SLR is the agency's guidance to applicants, and as such should not appear ambiguous as implied by phrase "Approved technical alternatives for SLR have yet to be developed."

Comment from ML16049A580

Staff Response – Not accepted

Technical Basis

The comment relates to mean RT_{ndt} calculations that are part of probability of failure (PoF) analyses and BWRVIP-05 relief requests for BWR RPV axial and circumferential. The PoF and mean RT_{ndt} calculations in BWRVIP-05 have yet to be updated for 80 year bases at capacity factors in excess of 80%, which is now common for the industry. As always, BWR facilities desiring to apply for BWRVIP-05 reliefs of their RPV circumferential welds will be required under 10 CFR 50.55a to re-apply for the relief requests during a subsequent PEO. Probability of failure analyses and mean RT_{ndt} analyses for the axial welds will be needed for such reliefs. Therefore, GALL SLR appropriately indicates that applicants having these types of TLAAs will need to address them on a case-by-case basis.

Summary of Staff Recommendations

Guidance will stay as written

QUESTIONS



Cross-Cutting Issues

**Office of Nuclear Reactor Regulation
Division of License Renewal**

Attachment 2: Comment 21

Industry Comment

Location of Change

SRP sections 1.1.5, 2.1.5, 2.2.5, 2.3.5, 2.4.5, 2.5.5, 3.1.5, 3.2.5, 3.3.5, 3.4.5, 3.5.5, 3.6.5, 4.1.5, 4.2.5, 4.3.5, 4.4.5, 4.5.5, 4.6.5, 4.7.5

Description of Change

SRP text allows for the proposal of acceptable alternative methods to those described in the GALL/SRP, but no guidance is provided for the determination of acceptability. Consider adding the following statement to the “Implementation” sections identified:

“Alternatives should be considered acceptable if:

1. They provide reasonable assurance that component intended functions will be maintained, or
2. If consistency with GALL/SRP recommendations would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.”

Attachment 2: Comment 21

Industry Comment, cont.

Justification For Change

The first criterion (reasonable assurance that component intended functions will be maintained) is consistent with the discussion of aging management reviews in SRP Appendix A, section A1.1: “The subsequent license renewal (SLR) process is not intended to demonstrate absolute assurance that SCs will not fail, but rather that there is reasonable assurance that they will perform such that the intended functions are maintained consistent with the CLB during the subsequent period of extended operation.”

Staff Response – Partially accepted

Attachment 2: Comment 21

Technical Basis

The guidance in the NUREG-2191 and NUREG-2192 documents do not constitute NRC-imposed requirements and are only guidelines that may be used to develop an SLRA. An applicant for an SLRA always has the option of proposing alternative aging management criteria different from those that will be issued in NUREG-2191 and NUREG-2192. The staff's guidelines for performing plant-specific aging management reviews and proposing plant-specific aging management programs or activities are already given in appendix A.1 of NUREG-2192.

Thus, there is no need to add acceptance criteria for approving alternatives under the commenter's basis in option 1 because the license renewal rule already assumes that: (a) the aging management bases in an SLRA will be reviewed by the staff on a case-by-case basis, and (b) a license renewal applicant would provide ample justification in its LRA for any plant-specific basis or alternative in order to demonstrate that the aging effects for a given structure, system, or component (SSC) will be adequately managed and the intended functions for the SSC will be maintained during a proposed period of extended operation (including SLR).

Attachment 2: Comment 21

Technical Basis, cont.

The staff cannot add acceptance criteria for approving alternatives under the commenter's basis in option 2 based on a consideration of hardships or unusual difficulties at the facility because these types of considerations only apply to Code relief requests that are submitted under the hardship criteria in 10 CFR 50.55a(z)(2). The aging management requirements in 10 CFR 54.21(a)(3) would not allow an SLR applicant to avoid aging management of applicable aging effects that could impact the intended function or functions of a SSC that has been scoped in for renewal and is subject to an AMR. This would be required even if the Commission had granted previous ASME code reliefs or regulatory exemptions in the CLB for the applicable SSC based on a consideration of hardships or unusual difficulties. In this case, the applicant would still be required to provide and justify some basis to manage the aging effects regardless of any Code reliefs or exemptions granted in the CLB.

Attachment 2: Comment 21

Summary of Staff Recommendations

Delete SRP-SLR sections 1.1.5, 2.1.5, 2.2.5, 2.3.5, 2.4.5, 2.4.5, 4.X.5 and 5.1.5

Proposed wording 3.X.5: “Except for cases in which the applicant proposes an alternative method for complying with specified portions of NRC regulations, NRC staff members follow the methods described herein in their evaluation of conformance with NRC regulations. For a proposed alternative, the staff evaluates the alternative on a case-by-case basis and finds it acceptable if the staff determines that the alternative provides reasonable assurance that the component’s intended functions will be maintained.”

QUESTIONS



GALL-SLR Report Chapter IV and SRP-SLR Section 3.1

**Office of Nuclear Reactor Regulation
Division of License Renewal**

GALL-SLR Chapter IV and SRP-SLR 3.1 Accepted Comments



15-007 SRP-SLR Section 3.1.2.2.19 will be deleted

15-011 Line items in GALL Tables IV.D1 and IV.D2 will be combined

15-019 Mislabeled titles

15-035 MRP-227 Revision 0 reference for FE Section 3.1.3.2.3.3 will
be updated to MRP-227-A

SRP-SLR Section 3.1.2.2.9

Industry Comment

Do not delete AMP XI.M16A.

Staff Response – The Staff agrees with this comment in part

Technical Basis

Staff agrees MRP-227-A report may be used as a starting point for a PWR vessel internals AMP for SLR. However, a gap analysis will need to be performed in conjunction with use of MRP-227-A to demonstrate the inspection and evaluation protocols in the report will remain justified for operations over a cumulative 80-year licensing period. Applicant's will still have the option of defining their own plant-specific PWR vessel internals programs. SRP-SLR further evaluations will still be needed to account for these types of considerations, but will be modified accordingly.

SRP-SLR Section 3.1.2.2.9

Summary of Staff Recommendations

Retain a modified form of XI.M16A, modify SRP-SLR Section 3.1.2.2.9, retain GALL and SRP line items from ISG, and revise FSAR Supplement. New line items allowing option of a plant-specific program will be retained as drafted in the GALL and SRP updates

Documented as TCD 15-001

SRP-SLR Table 3.1-1, Line 38

Industry Comment

Restore pump casings to XI.M1 management rows and remove pump casings from XI.M12 management rows.

Staff Response – The staff does not agree with this comment

Summary of Staff Recommendations – Changes to AMP XI.M12 and affected AMR line items, as related to managing loss of fracture toughness in CASS Class 1 pump casings will be retained as drafted in the GALL-SLR and SRP-SLR documents

Technical Basis

Refer to technical basis on the following two slides

Documented as TCD 15-002

SRP-SLR Table 3.1-1, Line 38

Technical Basis

Two major technical changes are proposed to AMP XI.M12 for SLR. First, the staff decided to modify the AMP to remove language that excludes pump casings from the additional aging management recommendations of XI.M12. The basis for this change is that formerly ASME Code Case N-481 specified additional examination and flaw tolerance requirements for pump casings as an alternative to the volumetric examinations required by the ASME Code, Section XI. However, Code Case N-481 has been withdrawn and some, but not all of the provisions of the code case were incorporated into more recent editions of section XI. Therefore, the staff decided that pump casings should be subject to the recommendations of the AMP including screening for thermal embrittlement and other actions such as enhanced inspections or component-specific flaw evaluations if the screening criteria are not met.

SRP-SLR Table 3.1-1, Line 38

Technical Basis, cont.

Second, under “detection of aging effects” Code Case N-824 is described as an acceptable method of performing ultrasonic (UT) examination of CASS piping less than or equal to 1.6 inches in thickness. This change is based on the recommendation of NRC staff experts in nondestructive evaluation and the fact that ASME Code Case N-824 has been approved by the ASME code and will be incorporated with conditions, in the next rulemaking revising 10 CFR 50.55a. Other changes included: (a) substitution of the term “potentially significant” for “susceptible” with respect to thermal aging embrittlement in recognition of the fact that CASS materials that meet the screening criteria can still have fracture toughness reduced from the unaged condition, but that the loss in fracture toughness is not significant with respect to the component’s structural integrity, and (b) clarification that the AMP is not applicable to CASS in reactor vessel internals.

Other changes are editorial. AMR Items are adjusted accordingly based on changes to AMP XI.M12.

SRP-SLR Section 3.1.2.2.15

Industry Comment

Delete 3.1.2.2.15 and associated GALL and SRP items.

Staff Response

- This item is addressed in the draft LR-ISG-2016-01, which adds visual inspections of steam generator head internal surfaces to the Steam Generator Program. These visual inspections are used to manage the aging effect (that is, loss of material due to boric acid corrosion).
- The staff is considering reflecting these changes in the GALL-SLR and SRP-SLR aging management items with deletion of the further evaluation section. The staff will finalize its position during the comment disposition for the draft LR-ISG.

Documented in TCD 15-010

SRP-SLR Table 3.1-1, 122

Industry Comment

Delete stainless steel, nickel alloy, and copper alloy from the material list. Delete “(steel, copper alloy only)” and delete condensation from the environment list

Staff Response - The Staff agrees with this comment in part

Summary of Staff Recommendations

SRP line item 122 (i.e., IV.C1.R-429, IV.C2.R-429) was deleted. Line item 124 was revised to cite any air environment (except air-dry internal) and condensation.

Technical Basis

Line items 122 and 124 overlapped in the cited MEAP

Documented in TCD 15-016

SRP-SLR Section 3.1.2.2.12

Industry Comment

- Delete Further Evaluation (FE) Section 3.1.2.2.12.1 or provide specific guidance for aging management of irradiation-assisted stress corrosion cracking (IASCC) in various BWR vessel internal components.
- Delete FE Section 3.1.2.2.12.2 for IASCC in access hole covers.

Staff Response – The staff does not agree with this comment

Summary of Staff Recommendations

No change

SRP-SLR Section 3.1.2.2.12 (Con't)

Technical Basis

- These SRP sections are written to ensure that continued operation of the reactor units for a cumulative 80-year licensing period would not invalidate the applicable EPRI BWRVIP assumptions used in the development of BWRVIP guideline reports and that recommended I&E guideline criteria in the reports would not need any revision.
- With respect to access hole covers, the staff's view is that each applicant needs to confirm whether the plant-specific neutron fluence levels can cause IASCC in the components. In addition, SRP Section 3.1.2.2.12.2 addresses the need for inspections using ultrasonic testing or other acceptable techniques if the welded access hole cover has a crevice. Therefore, the SRP section is not deleted.

Documented in TCD 15-022

SRP-SLR Section 3.1.2.2.14

Industry Comment

This discussion implies that, regardless of analytical results, enhanced inspections of core plate holddown bolts are required for SLR. The content should be clarified to indicate that inspections are only required if there is not an adequate technical basis to justify continuation of the inspection exemption.

Staff Response – The staff agrees with this comment in part

Summary of Staff Recommendations

Editorial changes will be considered to clarify that inspection or analysis may be used to manage the aging effect (loss of preload).

SRP-SLR Section 3.1.2.2.14 (Con't)

Technical Basis

For BWR internal core plates secured by rim holddown bolts, aging management of loss of preload may have been done using either BWRVIP inspection methods or a plant-specific TLAA. Therefore FE is needed to ensure that the basis for SLR is explained and justified

Documented in TCD 15-023

SRP-SLR Section 3.1.2.2.17

Industry Comment

On the basis that the NRC review of BWRVIP-62, Rev 1 did not identify concerns with this guidance for dead legs, the BWRVIP maintains that the FE recommendation in 3.1.2.2.17 is not needed

Staff Response – The Staff agrees with this comment in part

Summary of Staff Recommendations

- SRP-SLR 3.1.2.2.17 and 3.1.3.2.7 were deleted
- AMR line items continue to cite AMP XI.M7 and AMP XI.M2
- AMP XI.M7, BWR Stress Corrosion Cracking, was revised to state that the potential for stagnant flow conditions is considered when selecting inspections. The program identifies these locations.
- SRP-SLR Sections 3.1.2.2.16 Part (2), 3.1.3.2.16 Part (2), 3.2.2.2.9, 3.2.3.2.9, 3.3.2.2.9, and 3.3.3.2.9 were also deleted.

SRP-SLR Section 3.1.2.2.17 (Con't)

Technical Basis – AMP XI.M7, as modified, is sufficient to address potential stagnant flow environment conditions. FE is not necessary.

In addition, for BWR return line nozzles locations inspected by ASME Code Section XI inspections (with PDI), inspections performed in accordance with 10 CFR 50.55a and the Code rules are deemed sufficient without the need for FE. Therefore the staff will also consider deleting FE Sections 3.1.2.2.16 Part (1) and 3.1.3.2.16 Part (1) from the SRP-SLR, such that the SRP-SLR will no longer include any AMR items for CRD return line items that recommend FE.

Documented in TCD 15-024

QUESTIONS



AMP XI.M5, Boiling Water Reactor (BWR) Feedwater Nozzle

**Office of Nuclear Reactor Regulation
Division of License Renewal**

Attachment 1: Comment 11

Industry Comment

NUREG-0619 should be sunset and XI.M5, BWR Feedwater Nozzle retired.

Staff Response – Accepted

Technical Basis

Improvements in methods for volumetric testing qualifications eliminate the need for the methods outlined in AMP XI.M5 and make ASME Code methods under AMP XI.M1 appropriate. The updated ASME Code methods include an approved Code case which can be tied to the qualification requirements.

Summary of Staff Recommendations

- AMP will be deleted
- Associated AMR line items will be moved to AMP XI.M1

QUESTIONS



AMP X.M1, Fatigue Monitoring

**Office of Nuclear Reactor Regulation
Division of License Renewal
June 1, 2016**

Attachment 3: AMP X.M1

Industry Comment (Tracked as # 16-003)

Program Description, third paragraph: Clarify that the second aspect of the program described includes stress-based fatigue monitoring (SBFM), in which actual plant operating conditions (fluid temperatures, pressures, and flow rates) are monitored.

Proposed Markup: “*For the latter . . . design or analysis-specific limit. This option may include stress-based fatigue monitoring, in which operating temperatures, pressures, and other parameters are monitored and used to determine the effects of actual operating transients on the cumulative CUF and CUF_{en} for the analyzed components. This option periodically compares cumulative CUF and CUF_{en} to the limit of 1.0. Technical specification requirements. . . .*”

Comment Basis: Cycle-based and stress-based fatigue monitoring methods are currently in use at many plants

Resolution of #16-003 (Cont.)

Staff Response – Partially accepted

Technical Basis

The staff agrees that stress based monitoring activities were approved as part of Fatigue Monitoring Programs for some past license renewal applicants. Therefore, the comments seems reasonable for further editing of the AMP and editing of the further evaluation sections in the SRP-SLR report to refer that plant specific CUF methods are one method of performing CUF calculations.

Summary of Staff Recommendations

The AMP will be modified. For changes related to stress-based methods the staff attempted to use generic wording to ensure the AMP is broad enough in scope.

Attachment 3: AMP X.M1, #16-014



Industry Comment (Tracked as #16-014)

Lines 38-40 (of Element 10, Operating Experience) discuss the concerns in RIS 2011-14 regarding implementation of software programs to calculate fatigue usage “during plant transient associated with plant transient operations”. This should be revised to say “in analyses of plant transients”.

Recommended Markup: *Furthermore, as discussed in NRC RIS 2011–14, the staff has identified concerns regarding the implementation of computer software packages used to calculate fatigue usage ~~during plant transient associated with plant transient operations.~~*

Comment Basis: RIS 2011-14 states the concern to be analyst intervention into software programs which perform analyses. The way this is worded could infer the issue was with the use of WESTEMS for fatigue monitoring, which is not the case. WESTEMS used for monitoring does not afford analyst intervention in this manner.

Resolution of #16-014

Staff Response – Accepted

- In addition, a new paragraph will be added to cover operating experience for fatigue parameter analysis (e.g., CUF analyses, etc.) that apply to containments, structures, or structural components.

Technical Basis

Staff agrees with comment

Summary of Staff Recommendations

Staff will implement proposed changes to stated sentence. In addition, staff will add a new paragraph between the first and second paragraphs to generically address the OpE may apply to containments, structures, or structural components with fatigue parameter analyses, as the program is no longer limited to mechanical components or to the monitoring of CUF or CUF_{en} analyses.

Resolution of #16-014

Summary of Staff Recommendations

The new paragraph will read: *“As has been indicated in some past license renewal applications, the licensing basis for some plant may include fatigue parameter calculations for containments structures or structural components, such as containment penetrations or refueling, sealing or expansion bellows. An applicant’s fatigue monitoring program may be used to monitor the number and severity of transient occurrences for these structures or components (including any normal, upset, emergency, and faulted conditions transients that apply, as consistent with the licensing basis or design basis for the plant).”*

Attachment 3: AMP X.M1, #16-015



Industry Comment (Tracked as #16-016)

Table X-02 requires that CUF_{en} needs to be re-assessed as acceptable before the SLR application, rather than before entry into SLR period, and it specifies that the number of transients be projected and the TLAA is acceptable. This is not necessarily compatible with stress-based monitoring. An alternative should be included that permits the use of CUF projections based on stress-based CUF values computed over time using stress-based fatigue monitoring. . . .

Proposed Markup: None

Comment Basis: Similar to other comments made on use of stress-based fatigue methodologies.

Resolution of #16-015

Staff Response – Partially accepted, but only to delete Table X-02.

Technical Basis The staff expanded SRP-SLR Section 4.3 to include all types of time-dependent analyses that are based on an assessment of transient cycles, but broke these types of assessments into two groupings: (a) environmentally-assisted fatigue (CUF_{en}) calculations, and (b) all other types of cyclical loading analyses. Due to potential variations in the types of assessments, the staff finds it difficult to develop generic FSAR supplement wording that can encompass all specific types of cyclical loading analyses qualifying as TLAAs. Instead, the provided FSAR supplement examples for 10 CFR 54.21(c)(1)(i), (ii), and (iii) acceptance cases appropriately prompt the applicant to describe the each type of cyclical loading analysis that qualifies as TLAA under 10 CFR 54.3 criteria – this would cover any CUF analyses based on stress based methods.

Summary of Staff Recommendations

Table X-02 will be deleted

Table 4.3-1 will be retained as written

Attachment 3: AMP X.M1, #16-016



Industry Comment (Tracked as #16-016)

The title of Table X-02 reads “Aging Management Programs Discussed in SRP-SLR Chapter 4” but there are no “Aging Management Programs Discussed in SRP-SLR Chapter 4;” rather, this Section 4 discusses TLAA’s. The associated FSAR Supplements in our LRAs merely refer to AMPs (as needed for disposition of the TLAA); it does not contain the AMPs. Thus, the table needs a new title and the column for “Implementation Schedule” should be deleted – this could be confusing to the reader.

The “Completed” entries merely mean that NRC expects that the TLAA can be dispositioned using (i) or (ii); once again, there is no need for this column.

These examples of standard text for the “Evaluation of TLAA’s” can only be used as examples, not for verbatim compliance; just like the SRP-SLR says for Table 3.0-1: Table 3.0-1 of this SRP-SLR provides examples of the type of information to be included in the FSAR Supplement. This must be clarified somewhere.

Attachment 3: AMP X.M1, #16-016



Industry Comment, cont.

If Table X-02 is retained, then it should be moved to the SRP-SLR NUREG-2192, similar to Table 3.0-1.

The highlighted sentence at the bottom of Table X-02 should be deleted; there is no need to impose a license condition instead of a licensing commitment:

*An applicant need not incorporate the implementation schedule into its FSAR. However, the reviewer should verify that the applicant has identified and committed in the subsequent license renewal application to any future aging management activities to be completed before the period of extended operation. ~~The staff expects to impose a license condition on any renewed license to ensure that the applicant will complete these activities by no later than the committed date.~~

Staff Response – To Be Determined

QUESTIONS

AMP XI.M11B, Cracking of Nickel-Alloy Components and Loss of Material Due to Boric Acid-Induced Corrosion in Reactor Coolant Pressure Boundary Components (Pressurized Water Reactors Only)

**Office of Nuclear Reactor Regulation
Division of License Renewal**

Attachment 1: Comment 4

Industry Comment

- The GALL-SLR guidance recommended baseline inspection of bottom mounted instrumentation (BMI) nozzles using a qualified volumetric examination method is unnecessary.
- The existing program of regular visual exams is sufficient.

Staff Response – The staff disagrees with the comment

Attachment 1: Comment 4

Background

- The NRC staff discussed this industry comment during the April 26, 2016, public meeting.
- During the June 1, 2016, public meeting, the industry representatives explained why the existing bare metal visual (BMV) examination is adequate for the aging management beyond 60 years of operation, including the conclusions in MRP-167 and MRP-206.
- The industry rationale for the sufficiency of the existing visual examination for aging management is that the aging effects can be detected before a potentially serious safety event (but after a loss of the intended function, that is, reactor coolant pressure boundary function). The industry rationale is partially based on the perception that qualified UT methods do not exist.

Attachment 1: Comment 4

Technical Basis

- The GALL-SLR guidance includes necessary augmented activities for subsequent license renewal (beyond 60 years) in addition to the current inspection requirements specified in 10 CFR 50.55a to manage the aging effects due to primary water stress corrosion cracking (PWSCC) and boric acid corrosion.
- The proposed baseline inspection is necessary to ensure that the aging effects are not occurring in an unanticipated way or in a way that could challenge the intended function of the reactor coolant pressure boundary for the subsequent period of extended operation.
- Because of the important safety function of the BMI nozzles (e.g., non-isolable) and the increased likelihood of service-induced cracking as plant ages exceed 60 years, the staff concludes that a one-time volumetric examination is necessary to ensure that aging effects will not challenge the reactor coolant pressure boundary function during the subsequent period of extended operation.

Attachment 1: Comment 4

Technical Basis, cont.

- EPRI Report 1013535, “Nondestructive Evaluation: Utility Support for BMI Demonstrations,” October 2006, discusses demonstration of the ultrasonic methods in the EPRI MRP Alloy 600 BMI blind demonstration program. 12 plants have inspected Alloy 600 BMI nozzles with the UT methods.
- Also, the examination capability study described in MRP-166 has been used to support the adequacy of volumetric examination methods for BMI nozzles.
- The staff’s view is that previous capability studies and qualification activities can significantly reduce any additional efforts necessary to develop a qualified volumetric method capable of detecting PWSCC in BMI nozzles.
- The baseline volumetric inspection provision for aging management is consistent with voluntary volumetric inspections of BMI nozzles performed at some reactors for the current license term.

Attachment 1: Comment 4

Technical Basis, cont.

This comment disposition also considered the following:

- Recent 2013 domestic operating experience
- Increasing trend in PWSCC of cold-leg temperature reactor upper heads
- Potential for facilitated boric acid corrosion in a crevice or confined environment adjacent to BMI nozzles
- Case studies and qualification activities for volumetric examination of BMI nozzles

QUESTIONS



AMP XI.M31, Reactor Vessel Material Surveillance

**Office of Nuclear Reactor Regulation
Division of License Renewal**

AMP XI.M31: Reactor Vessel Material Surveillance



Appendix H to 10 CFR Part 50

Reactor Vessel Material Surveillance Program Requirements

I. Introduction: The purpose of the material surveillance program required by this appendix is to monitor changes in the fracture toughness properties of ferritic materials in the reactor vessel beltline region of light water nuclear power reactors which result from the exposure of these materials to neutron irradiation and the thermal environment.

Attachment 1: Issue No. 6

Industry Comment

Reactor vessel surveillance capsule fluence between 1 and 1.25 of the SLR peak fluence is required even though some plants have tested a capsule that has a higher fluence than 1.25 and no capsules remain. Consistent with existing requirements, capsule fluence between 1 and 2 of peak SLR fluence should be allowed.

Staff Response – Accepted

Summary of Staff Recommendations

- LR: withdrawal and testing of a capsule 1-2 times projected peak vessel neutron fluence for the period of extended operation; capsules moved to storage before accumulating excessive levels of neutron fluence.
- Revised to: the withdrawal and testing of a capsule with a neutron fluence between 1 and ~~1.25~~ 2 times the projected peak vessel neutron fluence for the subsequent period of extended operation.

Attachment 5: Lagging Lead Factor



Industry Comment

AMP XI.M31 assumes that surveillance capsules “lead” the peak pressure vessel fluence. Recent surveillance testing has shown that certain designs have capsules which “lag” the neutron fluence at the peak vessel location. Due to this, it is impossible for such plant to use their existing surveillance capsule specimens to evaluate future conditions of the pressure vessel embrittlement and specifically preclude the condition of achieve in a “fluence of between 1 and 1.25 times the peak reactor vessel wall neutron fluence projected at the end of the subsequent period of extended operation.”

Staff Response – Revising text

Summary of Staff Recommendations

Will revise description to include that the neutron fluence exposures surveillance capsules should cover the range of neutron fluence levels needed for vessel embrittlement calculations – i.e., ID for PWRs (PTS) and $\frac{1}{4}T$ for BWRs (P-T Limits).

Attachment 5: Issue No. 14-07, 18-03, 18-05, 18-06, 18-07, 18-28



Industry Comments

If a capsule has been examined in the prior 60 years of operation with a capsule fluence between 1-2 times the maximum ID fluence projected for the RPV for 80 years of operation, then withdrawal and testing of additional surveillance capsules during the subsequent period of extended operation should not be required.

Staff Response – Staff seeks further clarification

- Surveillance capsules reflect operating conditions of the RPV, not just fluence
- Discussion of capturing contemporaneous operating conditions by reinstalling the additional capsule

Attachment 5: Issue No. 18-25



Industry Comment

By design, the surveillance capsule dosimetry is withdrawn infrequently. Periodic measurements will help to confirm continued accuracy of the neutron fluence calculations. ASTM E2954-16 (Standard Guide for Monitoring the Neutron Exposure of LWR RPVs) should be referenced. Recommend a statement be added regarding periodic monitoring.

Staff Response – Staff seeks further clarification

Attachment 5: Issue No. 18-31



Industry Comment

The GALL-SLR would require a program to have both an SLR capsule and a contingency capsule (in case the SLR capsule test results are not valid). This results in some plants having to add two capsules for SLR.

Staff Response – Staff seeks further clarification

Attachment 5: Issue No. 18-33

Industry Comment

Use of “latest version” will ensure the language does not become outdated should RG 1.99 be revised. Recommend changing “Rev. 2” to “latest version.”

Staff Response – Not accepted

Summary of Staff Recommendations

- GALL-SLR references current regulations and guidance. Similar comment for references to Appendix H and ASTM E185-82.

Attachment 5: Issue No. 18-16

Industry Comment

Charpy is an indirect approximation of fracture toughness. Recommend that irradiated T_0 and upper-shelf J-R curve measurements can optionally be measured.

Staff Response – Not accepted

Summary of Staff Recommendations

- Options are too numerous to include.
- Options may not be efficient or effective in addressing GALL-SLR objectives.

Attachment 5: Issue No. 18-10

Industry Comment

It is unclear whether NRC approval of changes to the capsule testing schedule would need to be obtained prior to the submittal of the SLRA or as part of the application. There is a risk that the proposed testing schedule used to support SLRA is not approved.

Staff Response –To Be Determined

Note:

- Attachment 5: Issue No. 18-22
 - Reconstituted HAZ specimens
 - To Be Determined

QUESTIONS

QUESTIONS FROM MEMBERS OF THE PUBLIC

ACTION ITEMS

ADJOURN