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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

July 28, 2016

Agenda

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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

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Time	Agenda Topic
08:30AM – 08:35AM	Opening Remarks
08:35AM – 09:00AM	• SLR Supplement – staff to present disposition of industry comments
09:00AM – 09:15AM	• SRP-SLR Table 2.1-4(b) – discussion on the Reactor Coolant Pressure Boundary as an additional intended function
09:15AM – 09:30AM	• AMP XI.M31, Reactor Vessel Material Surveillance – staff to present disposition of industry comments
09:30AM – 09:45AM	• AMP XI.M5, Boiling Water Reactor Feedwater Nozzles – staff to present on final resolution • AMP X.M1, Fatigue Monitoring – staff to present on the use of NUREG/CR-6260 locations • SRP-SLR Section 4.3, Metal Fatigue – staff position to present on the use of NURG/CR-6909 Revision 0 and Revision 1 for determining the effect of LWR Coolant Environments on the fatigue life of Reactor Materials
09:45AM – 10:00AM	• GALL Chapter IV, SRP 3.1 – staff to present final disposition of industry comments
10:00AM – 10:10AM	Break
10:10AM – 10:45AM	• 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 final disposition of industry comments
10:45AM – 11:15AM	• AMP XI.M16A, Pressurized Water Reactor Vessel Internals – staff to present proposed AMP and further evaluation section wording with respect to the gap analysis
11:15AM – 11:45AM	• Industry presentation on EPRI Report 3002008128 “Structural Disposition of Neutron Radiation Exposure in BWR Vessel Support Pedestals” • Industry presentation on SRP-SLR Table 3.1-1 item 38 relative to Code Case N-481 for pump casings and associated flaw tolerance evaluation
11:45AM – 11:55AM	• Questions from members of the public
11:55AM – 12:00PM	Action Items, Closing Remarks, Adjourn

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Balance-of-Plant Sections

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Projecting Degradation – Update

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Industry Comment

- Relocate projecting degradation to the "monitoring and trending" (M/T) program element in lieu of the "acceptance criteria" program element.

Staff Response – In progress

- Staff's initial position is that projecting degradation can be addressed in the M/T program element.
- No changes to the potentially affected AMPs based on the June 23rd public meeting.
- In the process of incorporating changes. Considering:
  - Linking trending results to corrective actions (additional inspections) based on projections not meeting:
    - Acceptance criteria
    - Projecting a loss of intended function prior to end of subsequent PEO
  - Paralleling the recommendation on additional inspections in the M/T program element in lieu of pointing to corrective actions from the M/T program element
  - Addressing timing and frequency of additional inspections

SLR Supplement Comment Nos. 6, 9

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Industry Comment

- Minimize citing plant-specific AMPs in Table 1s.

Staff Response – Accepted

Technical Basis

- Further evaluation sections are necessary when the staff requires additional information to conduct its evaluation of specific material, environment, and aging effect (MEA) combinations.
- Many further evaluation sections can cite specific AMPs because the AMPs adequately address the MEA combination.

Summary of Staff Recommendations

- Citing plant-specific AMPs in SRP-SLR Sections 3.2, 3.3, and 3.4 eliminated, GALL-SLR Report AMR line items cite specific AMPs.
- SRP-SLR Section 3.1, 3.5, 3.6 – working

SLR Supplement Comment No. 1

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Selective leaching of ductile iron

Industry Comment

- Treat gray cast iron and ductile iron as a single sample population if initial inspections confirm selective leaching; however, analysis concludes no loss of intended function throughout subsequent PEO.

Staff Response – Partially Accepted

Technical Basis

- Gray cast iron is known to be susceptible to selective leaching – a full inspection population is warranted.
- Ductile iron is know to be susceptible to selective leaching; however, it is generally less susceptible than gray cast iron.

Summary of Staff Recommendations

- If the initial inspections conducted for ductile iron meet acceptance criteria, periodic inspections do not need to be conducted during the subsequent PEO for ductile iron.

SLR Supplement Comment No. 4

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Aluminum loss of material further evaluation (FE)

Industry Comment

- Conduct a search of operating experience (OE)
  - if no adverse OE, cite a one-time inspection
  - if there is adverse OE "a periodic AMP is instituted in accordance with the established corrective actions of the one-time inspection AMP."

Staff Response – Partially Accepted

Technical Basis

- Periodic AMPs are appropriate if OE or one-time inspection reveals aging effect.
- Timing of one-time or periodic inspections is consistent with that recommended in the AMP selected by the applicant during the development of the SLRA.

Summary of Staff Recommendations

- Revised FE section to clarify the information to be provided in the SLRA and when inspections are conducted.

SLR Supplement Comment No. 10

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Aluminum Stress Corrosion Cracking (SCC)

Industry Comment

- Provide specific considerations for assessing the aggressiveness of the environment.

Staff Response – Partially Accepted

Technical Basis

- For some locations of aluminum components, the plant configuration precludes the presence of halogens.
- Specific considerations might not be applicable due to plant configurations (e.g., ambient temperature).
- RG 1.36 is not applicable to aluminum.
- Repairs not applicable to environment.

Summary of Staff Recommendations

- General considerations included: halide-free indoor air, secondary sources of halogens (e.g., leakage), and encapsulation materials.

SLR Supplement Comment No. 42

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SCC in PWR Regenerative Heat Exchangers

Industry Comment

- Conduct a one-time inspection.

Staff Response – Staff reconsidered the further evaluation

Technical Basis

- Few PWR plants have experienced cracking
- Plant-specific OE should be self-revealing

Summary of Staff Recommendations

- Further evaluation section revised to:
  - No plant-specific OE – cites AMP XI.M2
  - Adverse plant-specific OE
    - AMP XI.M21A augmented to include temperature and radiation monitoring
    - Periodic eddy current testing of the heat exchanger tubes when practical

SLR Supplement Comment No. 44

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Carbonate cracking of buried components

Industry Comment

- Add “(high pH, bicarbonate environments only)” after steel.

Staff Response – Partially Accepted

Technical Basis

- Cracking can occur in low and high pH environments

Summary of Staff Recommendations

- Revised AMP XI.M41 to state, “steel (in a carbonate-bicarbonate environment)”

SLR Supplement Comment No. 77

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Fouling products in sprinkler piping

Industry Comment

- Delete or reword such that applicants need not confirm that "no" loose fouling products remain.

Staff Response – Partially Accepted

Technical Basis

- The proposed acceptance criterion is appropriate, "no loose fouling products exists in the sprinkler systems that could cause flow blockage in the sprinklers."
- It is unreasonable to expect that <u>every possible</u> loose fouling product has been removed from a system.

Summary of Staff Recommendations

- Added a specific corrective action.
- When loose fouling products that could cause flow blockage in the sprinklers are detected, a flush is conducted in accordance with the guidance in NFPA 25 Appendix D.5, "Flushing Procedures."

SLR Supplement Comment No. 80

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Long-term loss of material

Industry Comment

- Delete all long-term loss of material rows from GALL and SRP, and delete the inspection recommendations for this aging effect from XI.M32.

Staff Response – Not accepted, but changes incorporated

Technical Basis

- The staff technical basis has not changed.
- Recurring internal corrosion would not necessarily encompass long-term loss of material unless through-wall loss of material occurred
- Industrial OE reports corrosion rates varying from 3-5 mils/year in mild conditions
- Internal visual examinations are an effective means to detect general corrosion and localized corrosion such as pitting or crevice corrosion. However, uniform loss of material will probably not be detected by visual inspections.

SLR Supplement Comment No. 80

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Summary of Staff Recommendations

- Staff incorporated industry recommendations from the June public meeting.
- AMP XI.M32 was revised to include the following provisions that will specifically not require an exception to the program:
  - Conducting wall thickness measurements for long-term loss of material in a different AMP (e.g., AMP XI.M20) as long as the alternative AMP cites the necessary detail (e.g., environment, sample size, purpose of inspection).
  - Utilization of the data from recurring internal corrosion wall thickness measurements as long as the material and environment is consistent with that for long-term loss of material.
  - The use of scanning techniques (e.g., low frequency electromagnetic testing) as long as the method, coverage, and threshold for followup wall thickness measurements when indications are detected are stated in the SLRA.

AMP XI.M18, Bolting Integrity

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Summary of Staff Recommendations

Staff in the process of revising AMP XI.M18 to more effectively cover:

- Inspection size for leakage (all closure bolting) is 100%.
- Inspections for cracking of high-strength bolting is sampling-based, SLRA describes the sample size and frequency.
- Submerged bolting
  - Opportunistic head inspections and either:
    - Every 10 years inspected representative sample of head and threads, or
    - SLRA states alternatives to representative sample (e.g., pump vibration, sump pump operator rounds)
- Systems with air or gas, SLRA states:
  - Representative sample (as stated above)
  - Discolored external surfaces
  - Monitoring and trending of pressure decay
  - Soap bubble testing
  - Thermography

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Reactor Coolant Pressure Boundary Definition

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

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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.

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AMP XI.M31, Reactor Vessel Material Surveillance

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Additional Capsule Provision

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Summary of Various Industry Comments

(see Issue Nos. 14-07, 18-03, 18-05, 18-06, 18-07, 18-28)

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.

Additional Capsule Provision

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Staff Perspective

An additional capsule provides monitoring that optimally reflects the reactor vessel operating conditions, including the period prior to and the (early) subsequent period of extended operation.

- RPV embrittlement depends on neutron fluence and other factors, all of which are captured by the contemporaneous exposure of the additional capsule.
- This is consistent with Appendix H to 10 CFR Part 50
  - 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.
  - Under the program, fracture toughness test data are obtained from material specimens exposed in surveillance capsules, which are withdrawn periodically from the reactor vessel.

Additional Capsule Provision

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Staff Perspective

The additional capsule can come from:

- Re-designating a stand-by capsule that is in the RPV
- Re-inserting and re-designating a stand-by capsule that has been stored in the spent fuel pool
- Building a new capsule containing reconstituted specimens from previous testing
- Building a new capsule from containing specimens from unirradiated archival materials
- Participating in an Integrated Surveillance Program

Additional Capsule Provision

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Staff Perspective

GALL-SLR AMP XI.M31 represents the staff's assessment of an appropriate *generic* reactor vessel surveillance program for subsequent license renewal – not a requirement akin to Part 54 and Appendix H of 10 CFR Part 50

- "One size fits all" AMP that meets all existing programs is not possible.
- Due to the diverse conditions of the existing reactor vessel surveillance programs, each plant may not be able to meet all provisions of the proposed AMP (similar to other AMPs).
- Plants unable to meet the additional capsule (or any other) provision of the GALL-SLR AMP may either
  - Identify an "Exception" to GALL-SLR AMP XI.M31 and provide a justification
  - Identify a plant-specific AMP in the SLR application that the staff would review in accordance with Appendix A to SRP-SLR.
- Staff review of the SLR application would address relevant plant-specific considerations, as identified in the application.

Attachment 5: Issue No. 18-10

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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 subsequent license renewal application (SLRA) or as part of the application. There is a risk that the proposed testing schedule used to support the SLRA is not approved.

Staff Response – Staff sought clarification

Industry clarification – can the revised withdrawal schedule be part of the SLRA, or must it be submitted separately

- Per Appendix H, the proposed surveillance capsule withdrawal schedule must be submitted prior to implementation.
- Approval could be granted concurrent with the approval of the SLRA.
- If submitted with the SLRA, suggest highlighting this in the cover letter.

Attachment 5: Issue No. 18-14

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Industry Comment

Program Description should refer to "sufficient material data and dosimetry to (a) assess irradiation embrittlement at the end of the subsequent period of extended operation,…" instead of "monitor"

Staff Response – Not accepted

- "Monitor" is consistent with the Introduction of Appendix H to 10 CFR Part 50

Attachment 5: Issue No. 18-22

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Industry Comment

- Many plants will need to build reconstituted capsules for SLR to conform to GALL-SLR. The draft GALL-SLR provides no guidance for the material specimen contents of the reconstituted capsules.
- It is recommended that the reconstituted capsules include base metal and weld materials and that HAZ specimens should not be required.

Staff Response – Not accepted

Summary of Staff Recommendations

- The GALL-SLR does not provide a description of the number/type of reconstituted specimens in an additional capsule.
- Absent a change to Appendix H to 10 CFR Part 50 that would eliminate HAZ specimens, an Exemption to Appendix H may be warranted.

Attachment 5: Issue No. 18-28

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Industry Comment

XI.M31-4, Lines 40-45, For an already withdrawn capsule, recommending reporting of results per 10 CFR 50 Appendix H has been interpreted to require reporting within 1 year of renewed license.

- The data is not needed or useful as long as the RPV fluence has not exceeded a previous capsule measurement.
- Recommend changing to allow reporting any time prior to entering SLR operating period as long as previous capsule results have already been reported for a fluence greater than 60 year RPV fluence.

Staff Response – Not accepted

Summary of Staff Recommendations

- Reporting of the results within 1 year of receipt of the renewed license provides for timely notification and docketing of the embrittlement trends for the plant
- Extension may be granted

Attachment 5: Issue No. 25-09

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Industry Comment

Pages XI.M31-1 and XI.M31-4 conflict

- Page XI.M31-1 (lines 21-24) states that if standby capsules are going to be included and are not in the vessel, they shall be reinserted.
- Page XI.M31-4 (lines 40-45) states that if a capsule has already been pulled and has enough fluence it can be tested without inserting it back into the vessel.

Staff Response – No change

Summary of Staff Recommendations

- Although the intent is for standby capsules generally to be reinserted, the latter provision addresses the circumstance when the staff has approved testing a standby capsule with no additional exposure (for example, if the standby capsule has a fluence that greatly exceeds the projected 80 year RPV fluence).
- Variations between time in storage and neutron fluences.

Attachment 5: Issue No. 18-15

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Industry Comment

- XI. M31–1 (lines 38-40) states "If surveillance capsules are not withdrawn during the subsequent period of extended operation, provisions are made to perform dosimetry monitoring."
- Industry recommends that this statement be revised to state that the presence of an in-vessel standby capsule, coupled with use of an approved fluence prediction model consistent with RG 1.190 requirements, satisfies the need for dosimetry and fluence monitoring.

Staff Response – Accepted but no change

Summary of Staff Recommendations

- The cited statement does not address the use of in-vessel capsules
- The use of an in-vessel capsule provides sufficient dosimetry to satisfy provision (b) of the preceding sentence in XI.M31

Attachment 5: Issue No. 18-23

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Industry Comment

XI. M31 – 3, lines 28-30, Detection of Aging Effects

- The first paragraph refers to Element 3 as describing methods used to monitor irradiation embrittlement. This seems inappropriate as Detection of Aging Effects seems the correct program element to describe methods used for monitoring in the AMP.

Staff Response – Not accepted

Summary of Staff Recommendations

- Element 3 (Parameters Monitored or Inspected) is the appropriate program element to describe the monitoring method, consistent with SRP-SLR Appendix A.

Attachment 5: Issue No. 18-24

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Industry Comment

XI. M31 – 4, lines 1-7, Detection of Aging Effects

- Third paragraph indicates that a plant participating in an ISP is required by Appendix H to institute "a supplemental neutron monitoring program." It is not clear from the words in Appendix H that a supplemental neutron monitoring program is required in order to have an adequate dosimetry program. It would be good to include a definition of "supplemental neutron monitoring program" or to provide a reference to a regulatory standard or guideline that defines this.

Staff Response – Not accepted

Summary of Staff Recommendations

The supplemental neutron monitoring program is intended to meet the adequate dosimetry program requirement of Appendix H.

Attachment 5: Issue Nos. 18-34 and 35

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Industry Comment

Related to standard boilerplate wording of Program Elements 7 (Corrective Actions) and 10 (Operating Experience).

Staff Response – Not accepted

Summary of Staff Recommendations

The cited provisions are consistent with (updated) boilerplate wording used for all AMPs.

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AMP XI.M5, Boiling Water Reactor Feedwater Nozzles

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AMP XI.M5, BWR Feedwater Nozzles

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Industry Comment – Delete AMP XI.M5 and Sunset NUREG-0619

Staff Response – The Staff agreed with comment

Summary of Staff Recommendations

- AMP XI.M5 deleted from NUREG-2191
- AMP column entry for AMR Item No. 95 in SRP-SLR Table 3.1-1 and GALL-SLR AMR Item IV.B1.R-65 changes from AMP XI.M5 to AMP XI.M1, ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD
- No further evaluation required for ISI basis for inspecting BWR feedwater nozzle-to-vessel welds or nozzle-to-safe end welds

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AMP X.M1, Fatigue Monitoring and SRP-SLR Section 4.3, Metal Fatigue

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AMP X.M1 and SRP-SLR 4.3

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Industry Comment – Address issue with environmental fatigue calculations and monitoring bases: (a) use of NUREG/CR-6260 locations versus more limiting locations, (b) expand NUREG report references that involve methods for CUF_{en} calculations, and (c) include criteria for stress-based CUF calculations.

Staff Response – The Staff agreed with comments

Summary of Staff Recommendations

- To address the comment regarding the use of NUREG/CR-6260 locations versus more limiting locations, SRP-SLR Section 4.3 was updated to state: This sample set includes the locations identified in NUREG/CR–6260 (Ref. 11) and additional plant-specific component locations in the reactor coolant pressure boundary if they may be more limiting than those considered in NUREG/CR–6260. Alternatively, the sample set is limited to those locations which previously have been identified as the most limiting locations for the plant in the initial approved license renewal application.

AMP X.M1 and SRP-SLR 4.3

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Summary of Staff Recommendations, continued

- To address the comment to expand NUREG report references, AMP X.M1 and SRP-SLR Section 4.3 were updated to state: Environmental effects on fatigue for these critical components may be evaluated using the guidance in either Regulatory Guide (RG) 1.207, Revision 1; Section 4.3.1.2.3 of NUREG-1800, Revision 2 (SRP-LR Revision 2); or other NRC-endorsed alternatives.
- To address the comment to include criteria for stress-based CUF calculations, AMP X.M1 and SRP-SLR Section 4.3 were updated to include stress based CUF methods.
- FSAR supplements were adjusted accordingly

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

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SRP Subsection 3.1.2.2.12.2
(BWR Access Hole Covers)

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Industry Comment – Delete this FE section and corresponding review procedures and fluence levels for BWR access hole covers are low.

Staff Response – The Staff agreed to assess FE sections and associated AMR items one more time.

Summary of Staff Recommendations

- The staff agrees EPRI BWRVIP-180 is the proper basis for managing cracking in BWR access hole covers, such that FE Sections 3.1.2.2.12.2 and 3.1.3.2.12.2 are not needed. More generic confirmatory FE actions in 3.1.2.2.12.1 and 3.1.3.2.12.1 will apply for these generic locations. SRP AMR will state "Yes" for FE.
- The staff determined the proper condition monitoring program reference in the applicable AMR items should be AMP XI.M9, BWR Internals. AMP XI.M1 does not apply because BWR access hole covers are not typically defined as ASME Section XI components.
- AMP XI.M9 will be amended to cite use of BWRVIP-180 for inspections and evaluations of BWR access hole covers.

SRP Subsection 3.1.2.2.14
(BWR Core Plate Rim Holddown Bolts)

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Industry Comment – Component inspections are only required if there is not an adequate technical basis to justify continuation of the inspection exemption.

Staff Response – The Staff agreed with the comment basis in part.

Summary of Staff Recommendations

- Loss of preload aging effect may be managed either using AMP inspection bases or through performance of a TLAA (or both). Since TLAA may be applicable, FE Sections need to apply to the applicable AMR items for these bolts
- FE Section 3.1.2.2.14 and 3.1.3.2.14 have been amended to make the appropriate clarifications. If AMP XI.M9, BWR Vessel Internals is used for aging management, applicable BWRVIP inspection bases (e.g., BWRVIP-25) should be verified for acceptability. If TLAA is used, analysis methodology and basis for accepting under 54.21(i), (ii), or (iii) should be discussed and justified.

SRP Subsection 3.1.2.2.15
(Steam Generator Channel Heads)

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Industry Comment – Delete Subsection 3.1.2.2.15 and 3.1.3.2.15 and associated new draft AMR line items for steam generator (SG) channel heads.

Staff Response – The Staff agreed with the comment basis in part.

Summary of Staff Recommendations

FE Sections 3.1.2.2.15 and 3.1.3.2.15 and the associated AMR items for SG channels heads will be updated as necessary in accordance with the final LR-ISG-2016-01.

SRP Subsections 3.1.2.2.16, 3.1.2.2.17
(BWR CRD Return Lines)

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Industry Comment – Delete Subsections 3.1.2.2.17 and 3.1.3.2.17.

Staff Response – The Staff agreed with comment but interpreted it to expand to SRP FE Subsections 3.1.2.2.16, 3.1.3.2.16, 3.1.2.2.17 and 3.1.3.2.17.

Summary of Staff Recommendations

- Deleted FE Sections in SRP Subsections 3.1.2.2.16, 3.1.3.2.16, 3.1.2.2.17 and 3.1.3.2.17 from the scope of SRP Section 3.1.

- Adjusted AMR line items for BWR CRD return line nozzles, caps, safe ends, or rerouted piping to cite either AMP XI.M7, BWR Stress Corrosion Cracking, or AMP XI.M1 (ISI Program). Criteria in Subsection 3.1.2.2.17 incorporated into AMP XI.M7.

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QUESTIONS

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BREAK – 10 MINUTES

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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)

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Attachment 1: Comment 4

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Industry Comment

- GALL-SLR guidance recommends a one-time baseline inspection of susceptible bottom mounted instrumentation (BMI) nozzles using a qualified volumetric examination method. This inspection is unnecessary.

- The existing program of regular visual examinations is sufficient.

Staff Response – The staff disagrees with the comment.

Attachment 1: Comment 4

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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 reactor coolant pressure boundary function, i.e., structural and leak-tight integrity).

Attachment 1: Comment 4

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Background (continued)

- During the June 23, 2016, public meeting, the staff reemphasized the following technical basis:

  - 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 (RCPB) for the subsequent period of extended operation beyond 60 years of operation.

  - Because of the important safety function of the BMI nozzles (e.g., non-isolable RCPB) 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 RCPB function during the subsequent period of extended operation.

Attachment 1: Comment 4

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Background (continued)

- During the June 23, 2016, two items were identified for further clarification as follows:
  - If volumetric examination is conducted on BMI nozzles between 50 and 60 years of operation, is the examination creditable for the baseline examination recommended in the GALL-SLR guidance?
  - What is the specific qualification level of the baseline volumetric examination?

Attachment 1: Comment 4

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Time Window for the Baseline Volumetric Examination

- The staff agrees to the position that volumetric examination conducted within 10 years before the subsequent period of extended operation is creditable for the baseline volumetric examination.

- GALL-SLR AMP XI.M11B, "detection of aging effects" program element is revised to clarify this aspect as follows:

  "The inspection is conducted on all susceptible nickel alloy BMI nozzles within 10 years prior to the subsequent period of extended operation."

Attachment 1: Comment 4

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Qualification Level of the Examination Method

- As discussed in the previous public meetings, the staff's view is that the adequate qualification level of the examination method for the baseline BMI inspection is that consistent with ASME Code Section V, Article 14, intermediate rigor provisions including blind testing, or equivalent.

- GALL-SLR AMP XI.M11B, "detection of aging effects" program element is revised to clarify this aspect as follows:

  "In addition, this program performs a baseline inspection of bottom-mounted instrumentation (BMI) nozzles of reactor pressure vessels (RPVs) using a qualified volumetric examination method which meets the intermediate rigor provisions, including blind testing, of the 2015 edition of ASME Code Section V, Article 14, or equivalent."

Attachment 1: Comment 4

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Qualification Level of the Examination Method

- The staff is accounting for the following factors in clarifying the qualification level.
  - The low rigor level is based on technical justification only, and the high rigor level is based on full performance demonstration. In contrast, intermediate rigor provisions (limited performance demonstration) provide reasonable assurance of examination capability as well as acceptable flexibility in guidance implementation.

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QUESTIONS

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AMP XI.M16A, Pressurized Water Reactor Vessel Internals and SRP-SLR Section 3.1.2.2.9

Office of Nuclear Reactor Regulation
Division of License Renewal

AMP XI.M16A, SRP-SLR Subsection 3.1.2.2.9

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Industry Comment – Do not delete AMP XI.M16A and restore ISG AMR line items for PWR Vessel Internals

Staff Response – The Staff agreed with this comment in part. FE is still needed using either MRP-227-A with gap analysis or plant-specific AMP basis.

Summary of Staff Recommendations

- Amended version of AMP XI.16A restored into NUREG-2191. Gap analysis expectations defined in AMP. FSAR supplement for AMP XI.M16A has been modified accordingly.
- AMR items in LR-ISG-2011-04 retained in NUREG-2191 and NUREG-2192, but have been modified to indicate Yes for FE.
- FE Sections 3.1.2.2.9 and 3.1.3.2.9 in NUREG-2192 have been modified to allow use of MRP-227-A with a gap analysis.

AMP XI.M16A, SRP-SLR Subsection 3.1.2.2.9

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Summary of Staff Recommendations

The FSAR Supplement is revised as follows: FSAR Supplement
(Applicable if MRP-227-A is used as a starting point for the AMP)

The program relies on implementation of the inspection and evaluation guidelines in EPRI Technical Report No. 1022863 (MRP-227-A) and EPRI Technical Report No. 1016609 (MRP-228) to manage the aging effects on the reactor vessel internal components, as supplemented by a gap analysis. This program is used to manage (a) cracking, including stress corrosion cracking, primary water stress corrosion cracking, irradiation-assisted stress corrosion cracking, and cracking due to fatigue/cyclical loading; (b) loss of material induced by wear; (c) loss of fracture toughness due to either thermal aging, neutron irradiation embrittlement, or void swelling; (d) dimensional changes due to void swelling or distortion; and (e) loss of preload due to thermal and irradiation enhanced stress relaxation or creep.

[Applicant to provide additional details to describe the gap analysis associated with the AMP.]

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QUESTIONS

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INDUSTRY PRESENTATIONS

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QUESTIONS

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QUESTIONS FROM MEMBERS OF THE PUBLIC

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ACTION ITEMS

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ADJOURN