

ITEMS OF INTEREST – TECHNICAL SUMMARIES

In the June 1, 2022, public meeting on Subsequent License Renewal (SLR) guidance document updates, several items were identified as industry priorities for further discussion. These “items of interest” are described below. They are a subset of the 94 items on the Subsequent License Renewal Guidance Document Proposed Updates tracking list. Items are grouped by aging management program (AMP).

For each of the items of interest, technical staff members have provided recommended changes to the SLR guidance documents and technical bases. Project management staff have summarized the staff inputs. These summaries are intended to aid discussions during the next SLR guidance update public meeting on September 7-8, 2022. Staff subject matter experts will be available to discuss these topics in break-out sessions during the meeting. Regulatory decisions will not be made in the meeting.

TECHNICAL TOPICS

FIRE PROTECTION (XI.M26)

SME: TERRY

LOCATION OF CHANGES:

1. NUREG-2191, Volume 1, “Generic Aging Lessons Learned from Subsequent License Renewal (GALL-SLR) Report” (ML17187A031)
2. AMP XI.M26, “Fire Protection,” in NUREG-2191, Volume 2, “Generic Aging Lessons Learned for Subsequent License Renewal (GALL-SLR) Report” (ML17187A204)
3. NUREG-2192, “Standard Review Plan for Review of Subsequent License Renewal Applications for Nuclear Power Plants” (ML17188A158)
4. Table 2-29, “GALL-SLR Differences from Chapter XI, Mechanical Aging Management Programs, GALL Report Revision 2 and Their Technical Bases,” in NUREG-2221, “Technical Bases for Changes in the Subsequent License Renewal Guidance Documents NUREG-2191 and NUREG-2192” (ML17362A126)

SUMMARY OF CHANGES

The NRC staff is considering the following changes related to the Fire Protection program:

1. Revise the Program Description and the Scope of Program, Parameters Monitored or Inspected, Detection of Aging Effects, Monitoring and Trending, and Acceptance Criteria program elements to change “fire damper assembly” to “fire damper housing” to clarify that the fire damper housing is the passive component of a fire damper assembly that is subject to aging management. In addition, revise the applicable material for fire damper housings to metallic and remove aging affects associated with elastomers because fire damper housings are typically metallic materials. This change would clarify which components of a fire damper assembly are passive components and are subject to aging management and clarify the material and aging effects for fire damper housings. (Item Number 84)

2. Revise the Scope of the Program element to add that materials used to secure fire wraps are subject to aging management consistent with EPRI 3002013084, “Long-Term Operations: Subsequent License Renewal Aging Effects for Structures and Structural Components (Structural Tools).” EPRI 3002013084 states that materials used to secure fire wrap is part of the fire wrap. This change would clarify that materials used to secure fire wrap is subject to aging management since it is considered part of the fire wrap which is subject to aging management. (Item Number 85)
3. Revise the Detection of Aging Effects, Monitoring and Trending, and Acceptance Criteria program elements to add clarification that (1) results of inspections for all aging effects, not just cracking and loss of material, are trended to provide for timely detection of aging effects; (2) fire barriers include walls, ceilings, floors, and other fire barrier materials and that the results of inspections of fire barrier walls, ceilings, and floors and other fire barrier materials are trended to provide for timely detection of aging effects; and (3) separation of seals can also be from ceilings and floors, not just from walls and components. These changes would clarify trending of aging effects, fire barrier components, and where separation of seals can occur. (Item Number 87)
4. Revise the Program Description to state that AMP XI.M26 is complemented by AMP XI.S5, “Masonry Walls.” AMP XI.M26 currently only states that it is complemented by AMP XI.S6, “Structures Monitoring.” In addition, add a clarifying statement to the Program Description that states that the Structures Monitoring and Fire Protection programs would together manage applicable aging effects for structural fire barriers, and that the Masonry Walls and Fire Protection programs would together manage applicable aging effects for masonry walls that are considered fire barriers. This statement is consistent with AMP XI.S5, AMR item VII.G.A-626, SRP item 3.3-1, 179, and AMR item VII.G.A-90, SRP item 3.3-1, 060. This change would clarify the existing recommendation that both the Fire Protection and Masonry Walls programs manage applicable aging effects for masonry walls that are considered fire barriers, and that both the Fire Protection and Structures Monitoring programs manage applicable aging effects for structural fire barriers.. (Item Number 88)

Note: Consistent with AMR item VII.G.A-90, SRP item 3.3-1, 060, the NRC staff is considering revising the Scope of Program and Detection of Aging Effects program elements in AMP XI.S6, “Structures Monitoring,” to clarify the existing recommendation that both the Fire Protection and Structures Monitoring programs manage applicable aging effects for reinforced concrete structural fire barriers (walls, ceilings, and floors). AMP XI.M26 currently states it is complemented by AMP XI.S6 but AMP XI.S6 does not refer to AMP XI.M26.

FIRE WATER SYSTEM (XI.M27)

SME: TERRY

LOCATION OF CHANGES:

1. Table C1, “Open-Cycle Cooling Water System (Service Water System);” Table G, “Fire Protection;” and Table E5, “Waste Water Systems,” in NUREG-2191, Volume 1, “Generic Aging Lessons Learned for Subsequent License Renewal (GALL-SLR) Report” (ML17187A031)

2. AMP XI.M27, "Fire Water System," in NUREG-2191, Volume 2, "Generic Aging Lessons Learned for Subsequent License Renewal (GALL-SLR) Report" (ML17187A204)
3. Table 3.3-1, "Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of the GALL-SLR Report," in NUREG-2192, "Standard Review Plan for Review of Subsequent License Renewal Applications for Nuclear Power Plants" (ML17188A158)
4. Table 2-6, "New AMR Items Added in GALL-SLR Report, Chapter VII, Auxiliary Systems;" Table 2-20, "Changes to Existing GALL Report Revision 2 Chapter VII AMR Items Technical Bases;" and Table 2-29, "GALL-SLR Differences from Chapter XI, Mechanical Aging Management Programs, GALL Report Revision 2 and Their Technical Bases," in NUREG-2221, "Technical Bases for Changes in the Subsequent License Renewal Guidance Documents NUREG-2191 and NUREG-2192" (ML17362A126)

SUMMARY OF CHANGES:

The NRC staff is considering the following changes related to the Fire Water System program:

1. Revise Table XI.M27-1 in AMP XI.M27 to add footnotes related to:
 - Reduced standpipe and hose system flow tests when flow tests at the most hydraulically remote hose connections conducted no earlier than 5 years prior to the subsequent period of extended operation meet the design pressure at the required flow acceptance criteria.
 - Draining the hydrant barrel to at least 6 inches below the frost line if there is no plant-specific operating experience related to hydrant water freezing at or below 6 inches below the frost line.
 - Conducting fire pump suction screen inspections every 5 years in lieu of annually and after each system actuation when the fire pump does not take suction from a source of makeup with potential for bulk debris and suction screen inspections have met acceptance criteria.
 - Reduced sample size for main drain tests that have met acceptance criteria and plant-specific operating experience has not revealed any flow blockage in fire water system piping in the pipe size for the main drains or larger and conducting main drain tests on a 5-year interval in lieu of annually when main drain tests have met acceptance criteria and no adverse trend is evident.
 - Comparing full flow pressure test results not only to the immediately prior test result because significant degradation over several years may not be identified while still being less than 10 percent reduction from the previous test.
 - Conducting inspections of exterior surfaces of insulated fire water storage tanks consistent with the insulation removal and inspection recommendations in AMP XI.M29, "Outdoor and Large Atmospheric and Metallic Storage Tanks," in lieu of annually.
 - In addition, the NRC staff is considering an editorial change to Footnote 7 that would clarify the information to be included in the application for sprinkler testing.

These changes would adjust the recommended extent of tests and inspections, or their recommended frequencies based on results meeting acceptance criteria and incorporates insights from prior subsequent license renewal application reviews. (Item Number 41)

2. Revise AMP XI.M27, "Fire Water System," to retitle Column "NFPA 25 Section" to "Periodicity" in Table XI.M27-1 and add periodicities to column. Conforming changes made to Detection of Aging Effects and Corrective Actions program elements in AMP XI.M27 to refer to title of the tests or examinations rather than NFPA 25 sections. In addition, conforming changes are made to Footnotes 1 and 4, and Footnote 2 is changed to not used. These changes remove specificity while still referencing the appropriate portions of NFPA 25 so that the title of the tests or examinations remains while providing applicants flexibility in meeting the appropriate portions of NFPA 25. (Item Number 53)
3. Revise the Detection of Aging Effects program element in AMP XI.M27 to delete fire hydrant hose hydrostatic tests and gasket inspections because these components are typically excluded from aging management review based on guidance items (1) and (4) for consumables in SRP-SLR Table 2.1-3, "Specific Staff Guidance on Screening." This change would remove the recommendation to test and inspect components that are typically excluded from aging management review. (Item Number 45)
4. Revise items VII.C1.A-787a and VII.C1.A-787c in Table C1 in Volume 1 of NUREG-2191 to include treated water as an applicable environment based on an prior applicant citing this environment, to state that flow blockage due to fouling is only applicable to the raw water environment consistent with SRP-SLR item 3.3.1-253, and to state that loss of material due to wear is not applicable in a low flow environment based on The PVC Pipe – Design and Installation – Manual of Water Supply Practices, M23, American Water Works Association, 2nd Edition, 2002. These changes would clarify the applicable environments, the environment flow blockage due to fouling is applicable, and the environment loss of material due to wear is applicable.

Revise item VII.E5.A-787d in Table E5 and item VII.G.A-787b in Table G in Volume 1 of NUREG-2191 to state that loss of material due to wear is not applicable in a low flow environment based on The PVC Pipe – Design and Installation – Manual of Water Supply Practices, M23, American Water, 2nd Works Association Edition, 2002. These changes would clarify the environment loss of material due to wear is applicable.

Revise the aging effect/mechanism column for ID 253 in Table 3.3-1 of NUREG-2192 to state that loss of material due to wear is not applicable in a low flow environment based on The PVC Pipe – Design and Installation – Manual of Water Supply Practices, M23, American Water, 2nd Works Association Edition, 2002, and to state that flow blockage due to fouling is only applicable to the raw water and waste water environments consistent with item VII.E5.A-787d. These changes would clarify the environment loss of material due to wear is applicable and would make the environments in ID 253 consistent with item VII.E5.A-787d. (Item Number 56)

5. Revise the Program Description in AMP XI.M27 to add information regarding replacing or testing dry sprinklers and fast response sprinklers consistent with NFPA 25. AMP XI.M27 currently only addresses sprinklers that have been inservice for 50 years. This change would clarify when dry and fast response sprinklers are to be replaced or tested. (Item Number 95)

Cathodic Protection and External Coatings (Item Number 2)

LOCATION OF CHANGES:

GALL-SLR, AMP XI.M41

SUMMARY OF CHANGES:

Revise AMP XI.M41, "Buried and Underground Piping and Tanks," to:

- a) clarify that when the 100 mV criterion is utilized to protect copper alloy or aluminum alloy components, applicants must explain in the application why the effects of mixed potentials are minimal and why the most anodic metal in the system is adequately protected,
- b) clarify that evaluation of plant-specific operating experience (OE) includes out-of-scope buried components if they are representative of in-scope buried components,
- c) clarify that Preventive Action Category F inspection is for in-scope buried piping that has a cathodic protection system installed, which is not meeting the performance criteria defined in Preventive Action Category C,
- d) revise the "preventive actions" program element to recommend external coatings for underground cementitious piping, and
- e) include EPRI Report 3002005294, "Soil Sampling and Testing Methods to Evaluate the Corrosivity of the Environment for Buried Piping and Tanks at Nuclear Power Plants," Table 9-4, "Soil Corrosivity Index from BPWORKS," as an additional approach to determine soil corrosivity.

Selective Leaching and Pipe Sampling (Item Number 44)

OVERVIEW:

Revise Aging Management Program (AMP) XI.M33 "Selective Leaching" as follows:

- Eliminate the conditional exclusion of buried components with external coatings from inspection.
- Include malleable iron as a material susceptible to selective leaching.
- Clarify that a technical justification for using the extent of inspections in the AMP should be provided for gray cast iron piping exposed to soil.
- Clarify that 1-foot pipe samples should be taken from multiple locations to ensure that a representative sample is examined.

- Revise recommendations to include soil parameter consistency when providing a basis for reducing the total number of inspections at multiunit sites for buried components.
- Revise the last sentence of the “acceptance criteria” program element to cite criterion (d) instead of criterion (c) to correct an error.
- Include recent operating experience.

LOCATION OF CHANGES:

1. Technical Bases for Changes in the Subsequent License Renewal Guidance Documents NUREG–2191 and NUREG–2192 NUREG–2221 (Technical Basis Document) (add supplement)
2. Generic Aging Lessons Learned for Subsequent License Renewal (SLR), NUREG-2191 (GALL-SLR) Vol. 1, GALL-SLR Vol. 1, Chapter V, “Engineered Safety Features”
3. GALL-SLR Vol. 1, Chapter VII, “Auxiliary Systems”
4. GALL-SLR Vol. 1, Chapter VIII, “Steam and Power Conversion System”
5. GALL-SLR Vol. 2, Chapter “XI: Aging Management Programs” Section “XI.M33 Selective Leaching”
6. Standard Review Plan for Subsequent License Renewal (SRP-SLR), NUREG-2192, Table 3.2-1 “Summary of Aging Management Programs for Engineered Safety Features Evaluated in Chapter V of the GALL-SLR Report,” Table 3.3-1 “Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of the GALL Report,” and Table 3.4-1 “Summary of Aging Management Programs for Steam and Power Conversion System Evaluated in Chapter VIII of the GALL Report.”

SUMMARY OF CHANGES:

1. Revise Technical Basis Document Table 2-29 to add technical basis for the items listed in the Overview above.
2. Revise GALL-SLR Vol. 2, AMP XI.M33 Selective Leaching (XI.M33) program elements: Program Description; Evaluation and Technical Basis, Scope of Program, Detection of Aging Effects, Acceptance Criteria, and Operating Experience to include malleable iron as a material susceptible to selective leaching.
3. Revise AMP XI.M33 under program element Detection of Aging Effects,
 - a. add details on opportunistic and periodic inspections:
 - i. for sites with gray cast iron piping exposed to soil, a sample of 20 percent of the population with a maximum of 25 components are visually and mechanically inspected at each unit,
 - ii. when inspections are conducted on piping, a 1foot axial length section is considered as one inspection. Samples are taken from multiple locations to ensure that a representative sample is examined, focusing on components most susceptible to selective leaching.
 - b. For providing basis for conducting the reduced number of inspections of buried components at three unit sites, added that the basis should include, details on the

consistency of soil corrosivity testing parameters (e.g., soil resistivity, pH, chlorides, moisture) across the sites.

4. Revise AMP XI.M33 under program element Operating Experience, added three entries of including buried pipe ruptures, failures, and internal corrosion.
5. Revise components in SRP-SLR tables to include malleable iron, for Table 3.2-1 "Summary of Aging Management Programs for Engineered Safety Features Evaluated in Chapter V of the GALL-SLR Report," Table 3.3-1 "Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of the GALL Report," and Table 3.4-1 "Summary of Aging Management Programs for Steam and Power Conversion System Evaluated in Chapter VIII of the GALL Report."
6. Revise materials in GALL-SLR Vol. 1, Aging Management Review (AMR) tables to include malleable iron as a material for Chapter VII Auxiliary Systems:
7. Revise materials in GALL-SLR Vol. 1, AMR tables to include malleable iron as a material for Chapter VIII "Steam and Power Conversion System."
8. Revise GALL-SLR Vol 2, Chapter IX Use of Terms for Structures, Components, Materials, Environments, Aging Effects, And Aging Mechanisms, Table IX.C "Use of Terms for Materials," for section IX.C, to provide the definition for malleable iron, and to include this material in the definition on steel.

Piping AMP Implementation Schedules (Item Number 75)

LOCATION OF CHANGES:

1. GALL-SLR, AMPs XI.M27, XI.M29, XI.M30, XI.M32, XI.M33, XI.M35, XI.M41, and XI.M42, Table XI-01 AMP Implementation Schedule.
2. GALL-SLR Table XI-01, "FSAR Supplement Summaries for GALL-SLR Report Chapter XI Aging Management Programs," and SLRA App A1, Unit 1 UFSAR Table 19-3 Implementation Schedule

SUMMARY OF CHANGES:

Revise SLR Technical Bases to add technical basis for implementation schedule for the XI.M27 "Fire Water System," and other associated AMPs, in accordance with GALL-SLR Table XI-01, "FSAR Supplement Summaries for GALL-SLR Report Chapter XI Aging Management Programs," and SLRA App A1, Unit 1 UFSAR Table 19-3 Implementation Schedule. This will help explain why there is a contrast in the implementation schedules for all other AMPs, which state that the program is implemented 6 months prior to Subsequent Period of Extended Operation.

High Density Polyethylene (HDPE) And Carbon Fiber Reinforced Polymer (CFRP) Piping
(Item Number 67)**LOCATION OF CHANGES:**

Add aging management program (AMP) to Generic Aging Lessons Learned for Subsequent License Renewal, NUREG-2191 Vol 2 (GALL-SLR Vol. 2)

SUMMARY OF CHANGES:

1. XI.M 43 High Density Polyethylene (HDPE) and Carbon Fiber Reinforced Polymer (CFRP) Repaired Piping is a new proposed aging management program (AMP) that manages the aging of HDPE and carbon fiber reinforced polymer CFRP repaired piping. This program manages aging through preventive, mitigative, inspection, and in some cases, performance monitoring activities. It manages applicable aging effects such as loss of material and cracking.
2. This program applies to HDPE and CFRP repaired piping materials that meet the requirements of ASME Code, Section III, Mandatory Appendix XXVI, "Rules for Construction of Class 3 Buried Polyethylene Piping," as approved by the NRC. It also applies to piping where CFRP is applied to insulate the interior surface.
3. Depending on the material, preventive and mitigative techniques may include external coatings, cathodic protection (in accordance with NACE SP0169-2007 or NACE RP0285-2002), and the quality of backfill (in accordance with NACE SP0169-2007 Section 5.2.3 or NACE RP0285-2002, Section 3.6). Alternatives to the preventive actions are provided in the new AMP.
4. Depending on the material, inspection activities may include electrochemical verification of the effectiveness of cathodic protection, nondestructive evaluation of pipe wall thicknesses, pressure testing of the pipe, volumetric inspections, and visual inspections of the pipe from the exterior and/or interior.
5. Monitoring of the external and/or internal surface condition is conducted to detect aging effects such as loss of material, cracking, disbondment, damage, and leakage.
6. Volumetric examination may be utilized to measure wall thickness and detect delamination and/or disbondment in the CFRP piping. Volumetric examination of the CFRP piping may be performed using acoustic tap, ultrasonic, electrical, magnetic, thermal, microwave, or other applicable nondestructive methods.
7. For HDPE piping, visual inspections can be used for external and/or internal surface conditions of the HDPE. For CFRP repaired piping, visual inspections can be used for internal surface conditions of the CFRP.
8. For Detection of Aging Effects, inspections of HDPE and CFRP repaired piping guidelines and quantities are provided for a single unit plant, for two-unit sites, and for a three-unit site. Inspection quantities increase with increasing units, and for multi-unit sites, the inspections are distributed evenly among the units. Inspection quantities are provided in percentage of the length of pipe run or number of pipe segments.

9. Baseline inspections of HDPE and CFRP repaired piping are conducted during each 10-year period, commencing 10 years prior to the subsequent period of extended operation. Opportunistic inspections can be conducted for in-scope HDPE and CFRP repaired piping whenever they become accessible. Visual inspections are supplemented with surface and/or volumetric nondestructive testing if evidence of wall loss beyond minor surface scale is observed. Exceptions to inspection quantities and alternatives to visual examination are considered in the new AMP.
10. Piping inspection locations are selected based on risk (i.e., susceptibility to degradation and consequences of failure). Characteristics such as coating type (i.e., material type), coating condition, cathodic protection efficacy, backfill characteristics, soil resistivity, pipe contents, and pipe function are considered.
11. For monitoring and trending piping protected by cathodic protection systems, potential difference and current measurements are trended to identify changes in the effectiveness of the systems and/or coatings. Likewise, if leak rate testing is conducted, leak rates are trended. Where wall thickness measurements are conducted for the CFRP pipe, the results are trended when follow up examinations are conducted.
12. For CFRP repaired piping, acceptance criteria associated with this AMP generally include no evidence of coating degradation, cracking, loss of material, leakage, delamination, tearing, debonding, and voids.
13. For HDPE, acceptance criteria associated with this AMP generally include absence of cracking; blisters, gouges, or wear is within acceptable tolerance; acceptability of backfill; pressure tests within tolerance; and no visible indications of leakage.
14. For Corrective Actions, results that do not meet the acceptance criteria are addressed in the applicant's corrective action program under those specific portions of the quality assurance program. Degraded conditions are repaired, or the affected piping is replaced. In addition, the extent of degradation of the base metal that could have resulted in a loss of pressure boundary function when the loss of material is extrapolated to the end of the subsequent period of extended operation, and the inspection sample size is expanded.
15. Operating experience shows that pipes with CFRP could be degraded. It is necessary for the applicant to evaluate both plant-specific and nuclear industry OE and to modify its AMP accordingly. Examples of industry experience are provided.
16. Revisions to aging management review line items, the Standard Review Plan for Review of Subsequent License Renewal Applications for Nuclear Power Plants (NUREG-2192), Technical Bases for Changes in the Subsequent License Renewal Guidance Documents NUREG-2191 and NUREG-2192 (NUREG-2221) are forthcoming.

LOCATION OF CHANGES:

1. GALL-SLR: update Table IX.C, and add AMR Line item to III Table B5
2. SRP-SLR: add AMR line item to Table 3.5-1 and Further Evaluation sections

SUMMARY OF CHANGES:

Add wooden poles as a structural component requiring an aging management review. Based on the review of recent SLRAs, wooden poles were identified as a structural component requiring aging management during the subsequent period of extended operation, in part, due to the service life of wooden poles. The changes to the SRP-SLR and GALL-SLR Report will provide guidance on how to adequately manage the aging effects in wooden poles and will recommend a further evaluation to help determine the applicable inspection method and frequency of inspection for the wooden poles. (Item Number 24)

OVERVIEW:

The staff is updating the SRP-SLR and the GALL-SLR to finalize the guidance on managing the effects of aging on reactor vessel steel structural support assembly. This update includes adding two new SRP-SLR sections (3.5.2.2.2.7 and 3.5.3.2.2.7) and associated new AMR line items in SRP-SLR Table 3.5-1 and GALL-SLR. (Item Number 9)

LOCATION OF CHANGES:

1. GALL-SLR: add AMR Line items
2. SRP-SLR: add AMR line items to Table 3.5-1 and Further Evaluation sections (3.5.2.2.2.7 and 3.5.3.2.2.7)

SUMMARY OF CHANGES:

- Start with a physical examination and check for combined (synergistic) effects of aging associated with irradiation need to be addressed
 - Accepted methodologies include NUREG-1509 or applicant's own
 - Non-metallic, nonferrous components need to be also addressed
- If the radiation exposure damage level for a component of the RV steel support assembly is less than 2×10^{-5} dpa, there is no need for a further evaluation
- Three new VT-3 ISI AMR items and one AMR item in areas of RV ASME Class 1 supports (including weldments) with evidence of synergistic aging effects, volumetric and/or surface are proposed