NUREG-2191 and NUREG-2192 (February 2017 Draft)
Mechanical Comments

Comment #	Location of Change	Description of Change	Justification For Change
General-1	NUREG-2191 Chapter X & XI AMPs element 10, last paragraph	Remove review of research and development activities from AMP element 10 OE reviews.	AMPs are informed by plant specific and Industry OE that include Code and Industry standard changes. Research and development activities needs to be assessed for applicability through other reviews (e.g. EPRI, NRC National Labs/Universities, etc.). Research by itself can be misleading without further assessment. The requirement is too vague and will be problematic to demonstrate compliance if trying to prove all potentially research and development was considered.
Table X.01-1 XI.01-1	NUREG-2191 Tables X-01 and XI-01 Implementation Schedule column throughout tables	Recommend consistency with regard to the implementation schedule identified for AMPs in the fourth column of the table using “no later than six months prior to subsequent period of extended operation” unless there is an AMP-specific reason for a different schedule.	Although most aging management programs will likely be characterized as existing, many AMPs will require enhancement(s) to meet GALL-SLR, especially for those plants that referenced old revisions of GALL for first license renewal, or whose first applications were reviewed pre-GALL. It is expected that there will be a license condition requiring implementation of new AMPs and enhancements to existing AMPs to be completed no later than six months prior to the subsequent PEO for SLR. If that is to be the case, this timing expectation should be specified in the GALL Tables X-01 and XI-01 so that it gets built into the license renewal commitments up front. It appears that the “no later than six months” qualifier was only included for AMPs XI.M36, XI.M38, and XI.M42.
X.M1-1	NUREG-2191 AMP X.M1	Revise X.M1 and SRP-SLR Section 4.3 to expand NUREG report references and allow use of Section	Allows a plant specific justification consistent with NUREG-2192 Table 4.3-1 for a 10 CFR

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	Page X.M1, Line 13 Page X.M1-3 Line 27	4.3.2.1.3 of NUREG-1800, Revision 2 to evaluate environmental effects on fatigue. The following revision (or similar) is recommended to be inserted on page X.M1-2 in Line 13 and on page X.M1-3 in Line 27: "...A plant-specific justification can be provided to demonstrate that existing CUF_{en} calculations performed using the guidance in Section 4.3.2.1.3 of NUREG–1800, Revision 2, remain applicable for the subsequent period of operation when compared to guidance in RG 1.207, Revision 1, NUREG/CR–6909, Revision 0 (with "average temperature" used consistent with the clarification that was added to NUREG/CR–6909, Revision 1); or other subsequent NRC-endorsed alternatives...."	54.21(c)(1)(i) disposition – see components evaluated for CUF_{en} second paragraph.
SLR-SRP-1	NUREG-2192 Section 4.3.3.1.2.1 next to last sentence. pg 4.3-6	Revise NUREG 2192 Section 4.3.3.1.2.1 next to last sentence as noted below. "...A plant-specific justification can be provided to demonstrate that <u>existing CUFen calculations performed using</u> the guidance in Section ~~4.3.1.2.3~~ <u>4.3.2.1.3</u> of NUREG–1800, Revision 2, ~~is~~ <u>remain</u> applicable ~~to existing CUFen evaluations~~ <u>for the subsequent period of operation when compared to guidance in RG 1.207, Revision 1, NUREG/CR–6909, Revision 0 (with "average temperature" used consistent with the clarification that was added to NUREG/CR–6909, Revision 1); or other subsequent NRC-endorsed alternatives</u>...."	Corrects a typographical error and clarifies NUREG-2192 Section 4.3.3.1.2.1. As originally constructed, the plant-specific justification allowance presented in the sentence is not-useful unless it is linked to current CUF_{en} calculation guidance presented elsewhere in the GALL/SRP-SLR documents (RG 1.207, R1, etc.).
SLR-SRP-2	NUREG-2192 page 4.3-10 Table 4.3-1 54.21(c)(1)(i)	Correct typo graphical error in NUREG-2192, page 4.3-10, Table 4.3-1, 54.21(c)(1)(i) 2nd example, 2nd paragraph to read as follows:	Editorial comment

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	2nd example 2nd paragraph	"..~~4.3.1.2.3~~ 4.3.2.1.3 of NUREG–1800, Revision 2..."	
Table X.01-2	NUREG-2191 Page X01-1, Table X-01, X.M1 section	Delete the following from Table X-01 in the X.M1 Section as shown by the following strike through: The description of the program states "The aging management program monitors and tracks the number of occurrences and severity of design basis transients .....~~(including those that are calculated in accordance with plant-specific stress-based analysis methods)~~**.** Recommend adding the following sentence for stress based fatigue monitoring: "The program also monitors applicable design transient parameters (e.g., temperatures, pressures, displacements, strains, flow rates, etc.) for components with stress-based fatigue calculations."	The phrase identified in strikethrough should not be included in this sentence because stress based analysis (monitoring) monitors plant parameters not number of occurrences and severity. By monitoring of the parameters the occurrences and severities are already considered. The recommended addition provides a appropriate clarification for stress based fatigue calculations.
XI.M7-1	XI.M7, Page XI.M7-2, Element 4	Delete this new added text: ~~The potential for stagnant flow conditions such as dead legs is considered when selecting inspection locations. The program identifies these locations.~~ If necessary add: The selection of inspection locations is in accordance with BWRVIP-75-A.	• Adequate guidance already exists for the selection of inspection locations within the guidance for selection of inspection locations within BWRVIP-75-A, including consideration for stagnant flow conditions. (BWRVIP-75-A, Sections 3.1.1, 3.2.1, and 3.3.1). Including specific mention of "stagnant flow conditions" in the GALL AMP can cause confusion as to how other considerations for inspection locations listed in BWRVIP-75-A are to be addressed, such as high carbon content, evidence of weld repair, surface cold work, residual and operating stresses. • "Considered" is a meaningless term relative to what is expected in selecting inspection locations. Is there an intended meaning beyond

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			guidance already within BWRVIP-75-A? Given that the in-scope welds have to be 4"NPS or larger, then there are probably very few in scope welds that are in stagnant flow conditions. • The Industry does not know of industry OE where there have been additional SSC identified in welds in stagnant flow areas. • This statement may require an enhancement to the AMP to "identify" the stagnant locations in the AMP implementation documents, and then "consider" those locations in selection of inspection locations.
XI.M2-1	NUREG-2191 XI.M2 Program Description, 2nd paragraph	Update of AMP XI.M2 is requested to be consistent with EPRI PWR Primary Water Chemistry Guidelines Revision 7 (3002000505, April 2014).	This is consistent with previous Industry comments that identified PWRs have updated their Water Chemistry Programs to EPRI PWR Primary Water Chemistry Guidelines Revision 7.
XI.M9-1	NUREG-2191 XI.M9, Page XI.M9-3, Element 1	Delete the following text in element 1 of AMP XI.M9: ~~Control rod drive housing and lower plenum components (reactor vessel internal components): BWRVIP-47-A provides guidelines for inspection and evaluation; BWRVIP-55-A provides guidelines for repair design criteria.~~	Control rod drive housing and lower plenum components are managed consistent with BWRVIP-47-A as described in GALL Report AMP XI.M8, Boiling Water Reactor Penetrations. Therefore, components managed by BWRVIP-47-A do not need to also be managed by this AMP or discussed within Element 1, Scope of Program, for this AMP.
XI.M18-1	NUREG-2191 XI.M18 Element 4 3rd paragraph	Revise the third paragraph of XI.M18 to clarify that inspection requirements for high strength closure bolting and closure bolting for which yield strength is unknown apply to one bolt in a similar group of bolts that are greater *than 2 inc*hes in diameter.	Clarification of the AMP inspection requirements in element 4 for high strength closure bolting (actual yield strength greater than or equal to 150 ksi) is required. Consistent with ASME Examination Category B-G-1, NUREG-2191 Bolting Integrity

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			program appears to limit the examination to high strength closure bolting greater than 2 inches in diameter. In addition; for high strength closure bolting in piping systems, Examination Category B-G-1 specifies the examination of one bolted connection among a group of bolted connections that are similar in design, size, function, and service.
XI.M18-2	XI.M18 element 4 2nd bullet for air/gas bolting	Delete AMP XI.M18 element 4 second bullet for aging management of air/gas system bolting as noted below: ~~For closure bolting where the piping systems contains air or gas for which leakage is difficult to detect, the SLRA states how integrity of the bolted joint will be demonstrated. For example: (a) inspections consistent with that of submerged closure bolting; (b) when leakage of the environment inside the piping systems would discolor the external surfaces, a visual inspection for discoloration; (c) when the bolted connection is located within an isolated boundary, monitoring and trending of pressure decay; (d) soap bubble testing; and (e) when the temperature of the fluid is higher than ambient conditions, thermography testing.~~	OE indicates that M18 program visual inspections in conjunction with preventive actions have been effective at managing loss of preload for bolted connections in piping systems containing air or gas. This effort to demonstrate integrity of bolted joints for piping systems containing air or gas would be a significant endeavor with no appreciable benefit.
XI.M18-3	XI.M18 element 4 2nd bullet for air/gas bolting	Editorial: Revise AMP XI.M18 element 4 second bullet for aging management of air/gas system bolting as noted below to provide flexibility with various aging management options: For closure bolting where the piping systems contains air or gas for which leakage is difficult to detect, the SLRA states how integrity of the bolted joint will be demonstrated. For example: (a) inspections consistent with that of submerged closure bolting; (b) when leakage of the environment inside the piping systems	Revision of AMP XI.M18 element 4 second bullet for aging management of air/gas system bolting is requested to provide flexibility with various aging management options.

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		would discolor the external surfaces, a visual inspection for discoloration; (c) when the bolted connection is located within an isolated boundary, monitoring and trending of pressure decay; (d) soap bubble testing; ~~and~~ or (e) when the temperature of the fluid is higher than ambient conditions, thermography testing.	
XI.M20-1 XI.M21A-1 XI.M32-1 XI.M33-1 XI.M36-1 XI.M38-1	NUREG-2191 XI.M20 XI.M21A XI.M32 XI.M33 XI.M36 XI.M38 Element 7	**Corrective Actions (Expanded Inspection Sample)** **Open Cycle Cooling Water Systems (XI.M20)** **Closed Treated Water Systems (XI.M21A)** **One-Time Inspections (XI.M32)** **Selective Leaching (XI.M33)** **External Surfaces of Monitoring of Mechanical Components (XI.M36)** **Inspections of Internal Surfaces in Miscellaneous Piping and Ducting (XI.M38)** Revise element 7 of the AMPs noted above to provide a reasonable inspection sample for small inspection populations or inspection defects with limited extent of condition. Recommend revising the corrective action to read: "The number of increased inspections is determined in accordance with the site's corrective action program. As a minimum, the smaller of five additional inspections for each inspection that did not meet acceptance criteria or 20% of the inspection population is conducted. If subsequent inspections do not meet acceptance criteria, an extent of condition and extent of cause is conducted to determine the further extent of inspection."	Element 7 of the referenced AMPs was revised to require no fewer than five additional inspections for each inspection that did not meet acceptance criteria. Five additional samples would result in a disproportionately large inspection sample for small inspection populations or inspection defects with limited extent of condition.
XI.M21A-2	NUREG-2191 Pg IX M21A-	Element 7 states: "If the cause of the aging effect for each applicable	Provides clarification when repair or replacement would eliminate the need for additional

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	4 Element 7	material and environment is not corrected by repair or replacement, additional inspections are conducted if one of the inspections does not meet acceptance criteria." Revise this sentence to read as follows: "If a material and environment inspection sample component fails to meet acceptance criteria due to aging, and the component is not corrected by repair or replacement, additional inspection samples are required."	inspections.
XI.M27-1	NUREG-2191 XI.M27 Element 7	Revise the following paragraph to read as follows: If a flow test (i.e., NFPA 25 Section 6.3.1) or a main drain test (i.e., NFPA Section 13.2.5) does not meet acceptance criteria due to current or projected degradation (i.e., trending) additional tests are conducted. The number of increased tests is determined in accordance with the site's corrective action program; however, there are no fewer than two additional tests for each test that did not meet acceptance criteria. The additional inspections are completed within the interval (i.e., 5 years, annual) in which the original test was conducted. If subsequent tests do not meet acceptance criteria, an extent of condition and extent of cause analysis is conducted to determine the further extent of tests. At multi-unit sites, the extent of condition and extent of cause analysis could require ~~the additional tests include~~ inspections at all of the units with the same material, environment, and aging effect combination.	Based on the extent of condition and extent of cause analysis, the Licensee's corrective action program is sufficient to determine the scope and frequency of additional/increased testing requirements. The possibility exists where the cause of the aging degradation does not meet the acceptance criteria and would be limited to one unit of a multiple unit site.
XI.M29-1	NUREG-2191 XI.M29 Element 7	Revise to replace XI.M29 element 7, third paragraph, second bullet to read as follows: "For other sampling-based inspections (e.g., 20	The second bullet of Element 7 was revised to require a doubling of the inspection population was required. A doubling of the inspection population would result in a disproportionately

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	2nd bullet after 3rd paragraph	percent, 25 locations) that include components other than tanks, the smaller of five additional inspections or 20% of the inspection population is conducted. If subsequent inspections do not meet acceptance criteria, an extent of condition and extent of cause is conducted to determine the further extent of inspection."	large inspection sample for small inspection populations or inspection defects with limited extent of condition.
XI.M35-1	NUREG-2191 XI.M35, Page XI.M35-3, 4, Element 4 (Table XI.M35-1)	The text in Element 4 and Table XI.M35-1 notes the following: "Periodic examinations are implemented as per Category C if the one-time examinations detect any unacceptable flaws or relevant conditions." Table XI.M35-1, Category C applies only if the flaw condition is not mitigated. If the flaw condition identified during the one-time inspection is mitigated, Category B would apply and the one-time sample size would be expanded. Category C would not be entered. Clarification should be provided in Element 4 as follows - "Periodic examinations are implemented as per Category C if the one-time examinations detect any unacceptable flaws or relevant conditions <u>that are not mitigated</u>."	If the cause of the flaw condition is mitigated it is appropriate to expand the scope of one-time inspection as described in Category B, with the expanded scope inspection locations determined by extent of condition evaluation based on the cause of the failure. If the cause of the flaw condition isn't or cannot be mitigated it is appropriate to expand the scope of one-time inspection to implement periodic inspection as described in Category C.
XI.M35-2	NUREG-2191 XI.M35, Page XI.M35-3, 4, Element 4 (Table XI.M35-1)	See Exhibit M35-1 at the end of Attachment 2 for the recommended revisions to Table XI.M35-1. The criteria for periodic inspection scope and sample size for Category C, (where there is OE for age related cracking and there has not been 30 years of subsequent OE of no failures) should reflect the applicable extent of condition relative to the cause of the historical crack. As currently worded the periodic inspection scope includes the entire population of ASME Class 1 Small Bore Piping welds. The guidance for periodic inspection should require	The proposed changes are an attempt to apply some reasonableness to the selection of inspection locations focusing on the causes for the plant-specific failures, and to clarify the expectations that are not clearly communicated in the Table. • The Table as it is would cause a plant that has a single failure due to a specific cause, such as a bad piping design or broken piping support that causes abnormal fatigue, or a bad weld that doesn't leak until after some aging, to have to do as

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		that the periodic inspection scope be applied to population determined by extent of condition evaluation as determined by application of the corrective action program. See attached markup of Table XI.M35-1. It should be clear in the Table that there are 2 populations of welds (butt or socket) for Category B and C. The periodic inspection requirements should only apply to the type of weld with the OE failure. Note that the sample size percentages for periodic inspection of the susceptible welds should be higher than 10% since the size of the susceptible population will likely be small for most failures. Therefore, a sample size of 20% (doubling of 10%) of the susceptible welds with a maximum of 10 welds be examined every 10 years because that seems reasonable based on the small susceptible populations observed during first license renewal.	many as 25 UT examinations of socket welds every 10 years (75 total inspections) as a result of a condition until the corrective action has been proved effective per Note 3 (for 30 years). Most of the Class 1 small bore piping welds are inside containment in high dose areas. • Since the Table also doesn't specify that the periodic inspection requirements only apply to the type (socket or butt) weld that failed, it could be interpreted that a socket weld failure would result in additional one time inspections and periodic inspections of butt welds (and visa versa). This should not be intended and would result in a lot of unnecessary inspections, mostly in high dose areas. • The Exam scope as shown in the revised Table XI.M35-1 of Exhibit M35 is consistent with recent experiences in first license renewal where the extent of condition identified a small susceptible population (e.g. welds that were susceptible to cracking based on piping configuration that contributed to the cracking)
SLR-SRP-3	NUREG-2192 Page 4.3-4, Section 4.3.2.2	Revise Section 4.3.2.2 on page 4.3-4 as follows: The basis for demonstrating acceptance of the TLAA under 10 CFR 54.21(c)(1) ~~(ii)~~ should be included and demonstrated in the SLRA.	The reference to 10 CFR 54.21(c)(1) without the (ii) is more accurate since the FSAR supplement should address which ever disposition is credited not just (ii).
Table IV.D2-1	NUREG-2191 Table IV.D2 Row	Revise the environment for IV.D2.R-31 to identify an internal environment of steam or treated water. Also revise the structure and/or component column to identify the component as "Secondary	Replacement of "Air - indoor controlled" with "steam; treated water" and clarifying the component name to specify manway/handhole seating surfaces provides considerations that are

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	IV.D2.R-31	manway ~~covers~~ cover; handhole ~~covers~~ cover seating surfaces"	appropriate for an erosion aging evaluation. Manway external and internal surface evaluations not associated with erosion are covered by other NUREG-2191 AMR lines associated with Steam Generator components.

Exhibit M35-1
Revised Table XI.M35-1

Table XI.M35-1. Examinations					
Category	**Plant Operating Experience**	**Mitigation**	**Examination Schedule**	**Sample Size**	**Examination Method**
A	No age-related cracking (1) (2)	Not applicable	One-time: completed within 6 years prior to the start of the subsequent period of extended operation	Full penetration (butt) welds: 3% of total population per unit, up to 10 (4) Partial penetration (socket) welds: 3% of total population per unit, up to 10 (4)	Volumetric or destructive (5) (6)
B	Age-related cracking <u>of full penetration (butt) welds</u> (2)	Yes <u>(But do not have 30 years OE of no failures)</u> (3)	One-time: completed within 6 years prior to the start of the subsequent period of extended operation	Full penetration (butt) welds: 10% of total population per unit, up to 25 (4) Partial penetration (socket) welds: ~~10~~<u>3</u>% of total population per unit, up to ~~25~~ <u>10</u>(4)	Volumetric or destructive (5) (6)

Table XI.M35-1. Examinations					
Category	**Plant Operating Experience**	**Mitigation**	**Examination Schedule**	**Sample Size**	**Examination Method**
B	Age-related cracking of partial penetration (socket) welds (2)	Yes (But do not have 30 years OE of no failures) (3)	One-time: completed within 6 years prior to the start of the subsequent period of extended operation	Full penetration (butt) welds: 3% of total population per unit, up to 10 (4) Partial penetration (socket) welds: 10% of total population per unit, up to 25 (4)	Volumetric or destructive (5) (6)
C	Age-related cracking of full penetration (butt) welds (2)	No (Cause not corrected by design change or other corrective action)	~~Periodic: first examination completed within the 6 years prior to the start of the subsequent period of extended operation with subsequent examinations every 10 years thereafter~~ One-time: completed within 6 years prior to the start of the subsequent period of extended operation	Full penetration (butt) welds: 10% of total population per unit, up to 25 (4) Partial penetration (socket) welds: ~~10~~3% of total population per unit, up to ~~25~~10 (4)	Volumetric or destructive (5) (6)

Table XI.M35-1. Examinations					
Category	**Plant Operating Experience**	**Mitigation**	**Examination Schedule**	**Sample Size**	**Examination Method**
			Periodic: ~~first examination completed within the 6 years prior to the start of the~~ Ssubsequent examinations every 10 years after the start of the subsequent period of extended operation ~~with subsequent examinations every 10 years thereafter~~	Full penetration (butt) welds: ~~10~~20 % of susceptible population per unit, up to ~~25~~10 (7) ~~Partial penetration (socket) welds: 10% of total population per unit, up to 25 (4)~~	
C	Age-related cracking of partial penetration (socket) welds (2)	No (Cause not corrected by design change or other corrective action)	One-time: completed within 6 years prior to the start of the subsequent period of extended operation	Full penetration (butt) welds: 3% of total population per unit, up to 10 (4) Partial penetration (socket) welds: 10% of total population per unit, up to 25 (4)	Volumetric or destructive (5) (6)
			Periodic: Subsequent examinations every 10 years after the start of the subsequent period of extended operation	Partial penetration (socket) welds: 20% of susceptible population per unit, up to 10 (7)	

Table XI.M35-1. Examinations					
Category	**Plant Operating Experience**	**Mitigation**	**Examination Schedule**	**Sample Size**	**Examination Method**
NOTES: (1) Must have no history of age-related cracking. (2) Age-related cracking includes piping leaks or other flaws where fatigue or stress corrosion cracking are contributing factors. (3) Actions must have been taken to mitigate the cause of the cracking. These actions, such as design changes, would generally go beyond typical repair or replacement activities. If welds that have been redesigned or repaired and the applicant could demonstrate through OE that no additional failures have been reported for the last 30 years, then the inspection sample size could follow the guidance in Category A. (4) The welds to be examined are selected from locations that are determined to be the most risk significant and most susceptible to cracking. Other factors, such as plant-specific and industry OE, accessibility, and personnel exposure, can also be considered in selecting the most appropriate locations for the examinations. (5) Volumetric examinations must employ techniques that have been demonstrated to be capable of detecting flaws and discontinuities in the examination volume of interest. (6) Each partial penetration (socket) weld subject to destructive examination may be credited twice towards the total number of examinations because more information can be obtained from a destructive examination than from a nondestructive examination. (7) The welds to be examined are selected from locations that are determined to be susceptible to the cause(s) of cracking from extent of condition evaluation of the plant-specific age-related failure event(s). Other factors, such as industry OE, accessibility, and personnel exposure, can also be considered in selecting the most appropriate locations for the examinations.					