UNITED STATES
NUCLEAR REGULATORY COMMISSION
OFFICE OF NUCLEAR REACTOR REGULATION
WASHINGTON, DC 20555-0001

January 24, 2012

**NRC REGULATORY ISSUE SUMMARY 2012-02**
**INSIGHTS INTO RECENT LICENSE RENEWAL APPLICATION CONSISTENCY WITH THE GENERIC AGING LESSONS LEARNED REPORT**

## ADDRESSEES

All licensees submitting for license renewal under Title 10 of the *Code of Federal Regulations* (10 CFR) Part 54, "Requirements for Renewal of Operating Licenses for Nuclear Power Plants," except those who have permanently ceased operations and have certified that fuel has been permanently removed from the reactor vessel.

## INTENT

The U.S. Nuclear Regulatory Commission (NRC) is issuing this regulatory issue summary (RIS) to provide information to applicants on staff insights related to the consistency of recent license renewal applications (LRAs) with NUREG-1801, "Generic Aging Lessons Learned (GALL) Report" (hereafter, referred to as the GALL Report).

The purpose of this RIS is to inform future license renewal applicants (especially those with LRAs currently under development) of inconsistencies identified between LRAs and NUREG-1801 during a comparative review of recent LRAs. These inconsistencies resulted in the need to issue requests for additional information (RAIs), which increased the amount of applicant and staff resources needed to complete the evaluation of the LRA.

This RIS requires no specific action or written response. To support a reduction in the number of staff RAIs, the NRC recommends that licensees in the process of developing LRAs review the information contained in this RIS and consider taking actions to eliminate inconsistencies between their LRAs and the GALL Report, as necessary.

## BACKGROUND INFORMATION

NUREG-1800, Revision 2, "Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants," issued December 2010 (SRP-LR), references the GALL Report as a technical basis document. The GALL Report lists generic aging management reviews (AMRs) of systems, structures, and components that may be within the scope of LRA review and identifies aging management programs (AMPs) that the NRC finds acceptable for managing the aging effects expected during a plant's operation past the expiration date of its original license (i.e., during the period of extended operation). The NRC staff uses the GALL Report as a basis for its review of LRAs, consistent with guidance in the SRP-LR.

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The staff conducted a comparative review of recent LRAs to determine if there were common areas of inconsistency between the LRAs and the technical guidance in the GALL Report. These inconsistencies were all resolved using the RAI process by the time the NRC issued the safety evaluation report for each LRA; therefore, none of the inconsistencies identified by the NRC staff impacted the effectiveness of the applicant's programs for managing the aging effects identified in the LRA. However, the RAIs associated with these inconsistencies increased the amount of applicant and staff resources necessary to complete the evaluation of the LRA.

**SUMMARY OF ISSUE**

This document provides an overview of the inconsistencies identified between LRAs and the GALL Report and includes recommendations on how the applicant could structure the LRA in order to avoid unnecessary RAIs. The inconsistencies identified by the staff include the following:

- plant-specific environment definitions that are too inclusive
- materials included in the scope of the LRA AMP without including appropriate inspection techniques
- inadequate technical justification for exceptions
- use of less frequent inspection intervals without sufficient justification
- including components or material types not within the scope of a description in SRP-LR Tables 3.X-1
- citing the raw water environment for systems that could contain concentrations of unique chemicals
- inadequate consideration of atmospheric contaminants for materials exposed to an outdoor air environment
- inadequately addressed wear of elastomers
- final safety analysis report (FSAR) supplements not consistent with SRP-LR Table 3.0-1
- inadequate detail provided for outdoor insulation items
- component exposed to steam but managed with a treated water AMR item
- failure to consider all applicable aging effects
- insufficient detail when using the generic terms "elastomer" and "polymer"
- restrictive use of the GALL Report system tables when claiming consistency

These examples are typically specific to a material, environment, aging effect, and AMP combination; however, broader applicability is possible for many of the examples. For example, use of overly inclusive plant-specific environmental definitions is discussed below in the context

of the air-indoor uncontrolled environment; however, applicants should consider broader applicability of the example and compare all of their plant-specific environment definitions to the GALL Report definitions to ensure that the plant-specific environment definitions have not included environmental factors that could result in aging effects that are not included in the GALL Report standard environments.

Plant-Specific Environment Definitions That Are Too Inclusive

Applicants typically provide plant-specific definitions of service environments in a series of tables in Section 3.0 of the LRA. These tables give the plant-specific term for the environment as used in the LRA AMR tables, the description of the term, and a listing of the corresponding term for the environment in the GALL Report. Some applicants have included condensation or moist air within their plant-specific definition of "air-indoor uncontrolled," which will be referred to as "plant indoor air" for the purposes of this discussion. The GALL Report Table IX.D definition of air-indoor uncontrolled states that condensation can occur but only rarely and surfaces are normally dry.

The inclusion of condensation or moist air in the plant-specific definition of plant indoor air expands that environment such that aging effects could occur beyond those that would occur if the surface is normally dry, as stated in the GALL Report's definition of air-indoor uncontrolled. When applicants include condensation or moist air within the plant-specific definition of plant indoor air, the staff may not be able to determine whether the applicant has appropriately evaluated the AMR item.

For example, one station had AMR items associated with aluminum, copper alloy, stainless steel, and steel components that were exposed to a plant indoor air environment. The plant-specific plant indoor air environment included the GALL Report environments of air-indoor controlled, condensation, and moist air. In the LRA, each of the material types had AMR items that stated that there was no aging effect requiring management (AERM), and no AMP was proposed. The AMR tables did not have any plant-specific notes describing the specific environment to which the individual AMR items were exposed. In contrast, the GALL Report states that some of these materials have AERMs when exposed to condensation or moist air. Given the information provided in the LRA and the GALL Report recommendations, the staff had to issue RAIs, because with the all-inclusive plant indoor air plant-specific definition, the staff could not determine if condensation was present.

Given the number of AMR items exposed to some variant of an air environment, the applicant and staff reviews necessary to resolve RAIs of this nature require significant resources. In order to provide sufficient information to preclude the need for an RAI, the applicant should recognize the differences between the plant-specific and GALL Report environment definition and understand circumstances in which these differences may result in different aging effects for the same material. If the AERMs are different, the applicant should provide additional clarifying information, such as plant-specific notes, to justify why the aging effect does not require management. For example, an applicant would need to justify why no AERM is associated with aluminum components exposed to a plant-specific indoor air environment that includes condensation. However, if the actual environment for the components was consistent with the GALL Report definition for air-indoor controlled or air-indoor uncontrolled, a determination that there are no AERM is consistent with the GALL Report. In this example, the applicant could have used plant-specific notes to state that the aluminum components were not exposed to condensation.

Materials Included in the Scope of the LRA AMP Without Including Appropriate Inspection Techniques

Revision 2 of the GALL Report expanded the recommended range of materials in many of the AMPs (e.g., in Revision 1 of the GALL Report, AMP XI.M29, "Aboveground Steel Tanks," included only steel tanks, whereas in Revision 2 of the GALL Report, AMP XI.M29, "Aboveground Metallic Tanks," includes all metallic tanks). Nevertheless, the staff recognizes that it may be necessary to include materials in an LRA AMP beyond those recommended in the GALL Report AMP based on an applicant's plant-specific material, environment, and aging effect (MEA) combinations; however, the program elements, in particular "parameters monitored/inspected," "detection of aging effects," and "acceptance criteria" were developed based on the MEA combinations as stated in the GALL Report AMP. Therefore, when an LRA AMP includes a material type that is beyond those listed in the corresponding GALL Report AMP, the applicant should ensure that the AMP includes the appropriate inspection techniques.

For example, GALL Report AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components," includes metallic materials exposed to many different environments and recommends visual inspections. The GALL Report has no AMR items for copper alloy greater than 15 percent zinc that recommend the use of AMP XI.M38. This is appropriate because this material type is subject to selective leaching, which cannot be consistently detected by visual inspections alone. The GALL Report recommends AMP XI.M33, "Selective Leaching," a program that includes visual inspections coupled with mechanical examinations for copper alloy greater than 15 percent zinc components. In an application, the LRA AMR tables included copper greater than 15 percent zinc components exposed to raw water as being managed for loss of material by the applicant's Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program. The applicant had not enhanced its program to include mechanical examination techniques, nor did the applicant include an additional AMR item to manage these components with a program consistent with AMP XI.M33.

When an LRA AMP includes materials other than those stated in the GALL Report AMP, the applicant should ensure that its program addresses the appropriate inspection techniques for the MEA combination. If an alternative inspection technique would have been recommended in the GALL Report and it is not included in the program description, the staff will likely issue an RAI requesting the basis for not including the alternative inspection technique.

Inadequate Technical Justification for Exceptions

SRP-LR Section 3.0.1 states the following:

> If a GALL Report AMP is selected to manage aging, the applicant may take one or more exceptions to specific GALL Report AMP program elements. However, any deviation or exception to the GALL Report AMP should be described and justified. Exceptions are portions of the GALL Report AMP that the applicant does not intend to implement.

In addition, SRP-LR Sections 3.X.2.4 (e.g., 3.1.2.4, 3.2.2.4) states the following:

> If the applicant identifies an exception to any of the program elements of the cited GALL Report AMP, the LRA AMP should include a basis demonstrating how the criteria of 10 CFR 54.21(a)(3) would still be met. The reviewer should then

> confirm that the LRA AMP with all exceptions would satisfy the criteria of 10 CFR 54.21(a)(3).

The regulation in 10 CFR 54.21(a)(3), in turn, states the following:

> For each structure and component identified in paragraph (a)(1) of this section, demonstrate that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB [current licensing basis] for the period of extended operation.

Based on the SRP-LR and 10 CFR Part 54, "Requirements for Renewal of Operating Licenses for Nuclear Power Plants," exceptions need to be described and justified. The application must contain sufficient information for the staff to determine that the intended function of the component will be consistent with the CLB for the period of extended operation. In some cases, including the following example, applicants have not provided sufficient detail in the justifications for its exceptions. An applicant took exception to inspecting for loss of preload in its bolting integrity program. In its justification for the exception, the applicant appropriately cited that the installation torque values provided in plant procedures are based on industry experience and included expected relaxation of the joint. However, the applicant cited a reference that was not applicable to safety-related bolting and did not describe the controls in place to ensure compliance with procedures (e.g., training, qualifications, verification walk downs).

When the justifications for exceptions include incorrect references, and insufficient detail related to plant-specific information or processes, the staff must write RAIs to resolve the basis for accepting the exception.

Use of Less Frequent Inspection Intervals Without Sufficient Justification

Condition monitoring programs inspect for the presence and extent of aging. In some cases (e.g., AMP XI.M33), these programs can be used to confirm the absence of aging effects. The GALL Report AMPs are based on periodic, one-time, or opportunistic inspections. Opportunistic inspections occur periodically when components are opened for any reason; however, the GALL Report AMP does not define a fixed periodic interval. The NRC staff developed each GALL Report AMP based on expected MEA combinations and recommended the appropriate inspection interval. Inconsistencies between the LRA and the GALL Report often arise when the applicant chooses to use a program that may call for fewer inspections than recommended by the GALL Report in a given interval. Some applicants have selected GALL Report AMP XI.M32, "One-Time Inspection," for MEA combinations for which the GALL Report recommends a periodic or opportunistic program. For example, an applicant proposed to use a one-time inspection program instead of the program recommended in the GALL Report for elastomers exposed to indoor uncontrolled air. Elastomers are typically age-managed for hardening and loss of strength by GALL Report AMPs XI.M36 and XI.M38 because of the propensity of the elastomers to degrade as a result of environmental stressors. AMP XI.M36 is a periodic program, and AMP XI.M38 is an opportunistic program.

The GALL Report states that a one-time inspection program is used to do the following:

> The program verifies the effectiveness of an AMP and confirms the insignificance of an aging effect. Situations in which additional confirmation is appropriate include (a) an aging effect is not expected to occur, but the data are insufficient to rule it out with reasonable confidence; or (b) an aging effect is expected to

> progress very slowly in the specified environment, but the local environment may be more adverse than generally expected. For these cases, confirmation demonstrates that either the aging effect is not occurring or that the aging effect is occurring very slowly and does not affect the component's or structure's intended function during the period of extended operation based on prior operating experience data.

In the above example, the applicant justified its use of a one-time inspection program by stating that the program will be used to characterize conditions and determine whether, and to what extent, further actions may be required; however, the GALL Report recommends a periodic condition monitoring program for the specific MEA.

If the applicant selects a program with potentially fewer inspections in a given interval than the program recommended by the GALL Report, a technical justification should be included. The staff will likely issue an RAI requesting the basis for the reduced inspection frequency if the information is not provided in the LRA.

Including Components or Material Types Not Within the Scope of a Description in SRP-LR Tables 3.X-1

SRP-LR Tables 3.X-1 (e.g., 3.1-1, 3.2-1) list recommended material, environment, aging effect, and program (MEAP) combinations. For example, Table 3.3-1, item 29, recommends that steel (with stainless steel cladding) and stainless steel piping, piping components, and piping elements exposed to treated borated water be managed by AMP XI.M2, "Water Chemistry," for loss of material due to pitting and crevice corrosion. Each item represents a unique MEA combination with a corresponding recommended AMP. As recommended in Nuclear Energy Institute (NEI) 95-10, Revision 6, "Industry Guidelines for Implementing the Requirements of 10 CFR Part 54 - the License Renewal Rule," applicants can use an AMR item for a component type different than that listed in the SRP-LR table item and remain consistent with the GALL Report (i.e., cite generic note C or D); however, the applicant should ensure that the aging effects will be appropriately managed by the recommended AMP. In the following examples, the applicant included component and material types that were not within the scope of an SRP-LR Table 1 item.

Some applicants have cited Table 3.3-1, item 29 (see description above), to manage the aging of heat exchangers or tanks. However, this item in AMR Table 1 is for piping and is not sufficient for heat exchangers and tanks because they are more susceptible than piping to having stagnant flow areas where aging effects are more likely. This AMR item recommends AMP XI.M2 to manage aging, but it does not include a one-time inspection to check for stagnant flow areas were aging effects are more likely. The program description for GALL Report AMP XI.M32, "One-Time Inspection," states, "However, there may be locations that are isolated from the flow stream for extended periods and are susceptible to the gradual accumulation or concentration of agents that promote certain aging effects. This program provides inspections that verify that unacceptable degradation is not occurring." AMP XI.M32 supplements AMP XI.M2 by verifying the effectiveness of the water chemistry controls in preventing the aging effects. Since heat exchangers and tanks are more susceptible to stagnant flow conditions, AMP XI.M32 should be used. It would therefore be inappropriate to age-manage a heat exchanger or tank in the same manner as piping, piping components, and piping elements since AMR item 3.3.1-29 does not recommend a one-time inspection. Similarly, if an applicant is aware that one of its systems has many stagnant flow areas, it should supplement AMP XI.M2 with AMP XI.M32, even though the AMR table does not specifically recommend the practice.

As an additional example, an applicant included cast austenitic stainless steel (CASS) components in a line item intended for stainless steels and then stated that the AMR item was consistent with the GALL Report. The applicant cited SRP-LR, Revision 1, AMR items 3.1.1-55, 3.1.1-68, and 3.3.1-90, to age-manage CASS filter bodies. CASS material is unique from stainless steel in that, in accordance with GALL Report Section IX.C, it is susceptible to loss of fracture toughness due to thermal and neutron embrittlement. Item 3.1.1-55 includes CASS Class 1 pump casings and valve bodies and bonnets exposed to reactor coolant at temperatures greater than 250 degrees Celsius (greater than 482 degrees Fahrenheit). GALL Report AMP XI.M12, "Thermal Aging Embrittlement of Cast Austenitic Stainless Steel," excludes pump casings and valve bodies from management by AMP XI.M12, but not filter bodies. The primary source document, C.I. Grimes to D.J. Walters, "License Renewal Issue No. 98-0030, Thermal Aging Embrittlement of Cast Austenitic Stainless Steel Components," dated May 19, 2000 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML003717179), only exempts pump and valve bodies. Citing item 3.1.1-55 for a filter is not appropriate because the item only includes pump casings and valve bodies. Items 3.1.1-68 and 3.3.1-90 include a variety of stainless steel, but not CASS components, and therefore, citing them for CASS items is not appropriate because the thermal embrittlement aging effect will not be addressed.

Applicants should ensure that the component and material type are consistent with the cited SRP-LR Table 1 item. When an applicant chooses to cite an SRP-LR Table 1 item despite an inconsistency with the component or material type, it should include plant-specific notes to justify the difference, or the staff will likely issue an RAI requesting the basis for the non-consistency with the GALL Report.

Citing the Raw Water Environment for Systems that Could Contain Concentrations of Unique Chemicals

GALL Report Section IX.D defines the raw water environment as consisting of untreated surface or groundwater, whether fresh, brackish, or saline in nature. This includes water for use in open-cycle cooling water systems and may include potable water.

Several applicants have cited the raw water environment for systems such as chlorine addition and plant drains. Given the GALL Report definitions, the raw water environment is the definition that fits most closely; however, these systems can contain chlorine, oil, halogenic materials, or other substances that could affect the aging of components. This is particularly true when the system uses polymeric materials. For example, if fiberglass piping is exposed to chlorine levels above 20 percent, aging will likely occur. In multiple cases, applicants have stated that there are no aging effects, but the staff had to issue RAIs to determine the content of chemicals in the raw water. In response to RAIs, applicants have added AERMs and AMPs based on the specific chemicals in the raw water.

Applicants should review the chemicals or contaminants that would be expected to be present during normal plant operations in a system's raw water. They should include plant-specific notes that describe the presence or absence of chemicals or contaminants in raw water systems, such as chlorine addition or plant drains. If the staff's review of the system description and Table 2 AMR items results in ambiguity related to the potential for chemicals or contaminants in a raw water system, the staff will likely issue an RAI requesting the chemical species and concentrations in order to determine if there is an unidentified aging effect.

Inadequate Consideration of Atmospheric Contaminants for Materials Exposed to an Outdoor Air Environment

In Revision 2 of the SRP-LR, Section 3.2.2.2.3 (and other sections on further evaluation) addresses loss of material due to pitting and crevice corrosion. Item 2 of this section addresses stainless steel piping, piping components, piping elements, and tanks exposed to outdoor air. Specifically, Item 2 states the following:

> Loss of material due to pitting and crevice corrosion could occur for stainless steel piping, piping components, piping elements, and tanks exposed to outdoor air. The possibility of pitting and crevice corrosion also extends to components exposed to air which has recently been introduced into buildings, i.e., components near intake vents. Pitting and crevice corrosion is only known to occur in environments containing sufficient halides (primarily chlorides) and in which condensation or deliquescence is possible. Condensation or deliquescence should generally be assumed to be possible. Applicable outdoor air environments (and associated indoor air environments) include, but are not limited to, those within approximately 5 miles of a saltwater coastline, those within ½ mile of a highway which is treated with salt in the wintertime, those areas in which the soil contains more than trace chlorides, those plants having cooling towers where the water is treated with chlorine or chlorine compounds, and those areas subject to chloride contamination from other agricultural or industrial sources. This item is applicable for the environments described above.
>
> The applicant may demonstrate that this item is not applicable by describing the outdoor air environment present at the plant and demonstrating that external pitting or crevice corrosion is not expected. The GALL Report recommends further evaluation to determine whether an aging management program is needed to manage this aging effect based on the environmental conditions applicable to the plant and requirements applicable to the components.

Revision 1 of the GALL Report did not address these specific provisions. Four recent applications, submitted with references to Revision 1 of the GALL Report, all included stainless steel piping exposed to outdoor air. Three of the four stated that all or portions of the stainless steel piping exposed to outdoor air had no AERM and no proposed AMP.

Although Revision 1 of the GALL Report did not cover them, these aging effects were clearly addressed in metallurgical references. The GALL Report does not include all possible MEA combinations. Applicants could have plant-specific materials exposed to outdoor air that could degrade as a result of deleterious compounds in the atmosphere associated with arid land, agriculture, industrial plant emissions, road salt compound, cooling tower vapor, and trace compounds. When identifying materials that are not addressed in the GALL Report, the applicant should review metallurgical references to determine if there are AERM and provide plant-specific notes documenting the absence of deleterious atmospheric compounds that could cause aging effects in the material. The staff will likely issue an RAI if atmospheric contaminants could affect aging of outdoor components and no AERM or AMP is listed in the LRA.

Inadequately Addressed Wear of Elastomers

In Revision 1 of the SRP-LR, Section 3.3.2.2.13 stated that "Loss of material due to wear could occur in the elastomer seals and components exposed to air indoor uncontrolled (internal or external). The GALL Report recommends further evaluation to ensure that these aging effects are adequately managed." AMR item 3.3.1-34 is associated with Section 3.3.2.2.13, which states that a plant-specific AMP is to be evaluated. Revision 2 of the SRP-LR AMR replaced item 3.3.1-34 with items 3.3.1-82 and 3.3.1-96 and removed the further evaluation requirement. These two new AMR items recommend the use of GALL Report AMPs XI.M36 and XI.M38 to manage the aging effect. GALL Report Section IX.F defines wear as "the removal of surface layers due to relative motion between two surfaces or under the influence of hard, abrasive particles. Wear occurs in parts that experience intermittent relative motion, frequent manipulation, or in clamped joints where relative motion is not intended, but may occur due to a loss of the clamping force."

Although they submitted with reference to Revision 1 of the GALL Report, several applicants cited AMPs XI.M36 and XI.M38 to address the aging effect. However, a few applicants stated that the aging effect was not applicable because either (1) wear is attributable to improper design, application, or operation, or it occurs during an active function, or (2) items that are subject to wear are replaced on a periodic basis. The staff issued an RAI for each of the plants. The RAI paralleled the GALL Report's definition of wear and asked the applicant to state whether it had any in-scope components that are subject to wear as a result of internal hard abrasive particles, frequent manipulation, or loss of clamping force over time. The applicants revised their LRAs after reevaluating the elastomeric components to include wear as an aging mechanism, and they included an AMP to manage the aging.

An applicant should review its elastomeric components to ensure that the components are not subject to age-related degradation from wear using the range of aging mechanisms contained in the GALL Report definition of wear. The staff will likely issue an RAI if an applicant states that loss of material due to wear is not applicable and does not provide an adequate basis.

FSAR Supplements Not Consistent with SRP-LR Table 3.0-1

Revision 2 of the SRP-LR, Section 3.1.2.5, states the following in regard to material provided in the FSAR supplement:

> The summary description of the programs and activities for managing the effects of aging for the period of extended operation in the FSAR Supplement should be sufficiently comprehensive that later changes can be controlled by 10 CFR 50.59. The description should contain information associated with the bases for determining that aging effects will be managed during the period of extended operation. The description should also contain any future aging management activities, including enhancements and commitments, to be completed before the period of extended operation. Table 3.0-1 of this SRP-LR provides examples of the type of information to be included in the FSAR Supplement.

Each applicant, in accordance with 10 CFR 54.21(d), must provide an FSAR supplement, and "The FSAR supplement for the facility must contain a summary description of the programs and activities for managing the effects of aging and the evaluation of time-limited aging analyses for the period of extended operation determined by paragraphs (a) and (c) of this section, respectively." For most applications, the staff has had to issue RAIs because the applicant did

not include applicable information from the example summaries in SRP-LR Revision 2 Table 3.0-1 (previously Tables 3.X-2 in SRP-LR Revision 1). As an example, for the aboveground steel tanks program, the applicant did not address that the program includes preventive measures to mitigate corrosion by protecting the external surface of steel components in accordance with standard industry practice and by using sealant or caulking at the interface of concrete and component, and that it includes verification of the effectiveness of the program by measuring the thickness of the tank bottoms to ensure that significant degradation is not occurring.

An applicant should ensure that its FSAR supplement description of the program includes all of the applicable details discussed in SRP-LR Table 3.0-1. An applicant should also ensure that the FSAR supplement description of the program includes any plant-specific AMP details that are "associated with the bases for determining that aging effects will be managed during the period of extended operation," as stated in Revision 2 of the SRP-LR. The staff will likely issue an RAI if the applicant's FSAR supplement program description does not meet the level of detail provided in SRP-LR Table 3.0-1.

Inadequate Detail Provided for Outdoor Insulation Items

Of eight recent LRAs, half of the plants had in-scope calcium silicate or fiberglass insulation, with an intended function related to heat transfer, which was exposed to outdoor air. In all cases, the applicants stated that there were no AERMs or recommended AMPs. The staff has two issues with this MEAP combination.

Industry operating experience makes it clear that both calcium silicate and fiberglass insulation will degrade when exposed to moisture. For insulation exposed to indoor air, moisture intrusion only occurs as a result of periodic conditions adverse to quality, such as leakage from the component or a component above the insulated pipe. However, outdoor insulation is subject to rainfall and potential wide swings in humidity levels as a normal aging environmental impact. Therefore, the staff issued RAIs asking the applicant to state the controls that prevent the intrusion of water into the insulation. Such intrusion is typically addressed by plant-specific procedures that control the installation of the insulation such that insulating jacketing gaps are on the bottom of the component and joints overlap.

The second issue is related to the material of the piping underneath the insulation. If the piping is constructed of stainless steel, it is susceptible to aging due to compounds leaching from the insulation if the insulation contains sodium, silicates, or chlorides. The FSAR typically describes insulation leaching testing for reactor coolant pressure boundary insulation. However, the staff will not know if outdoor insulation is controlled to the same standards as reactor coolant pressure boundary insulation, and it must issue an RAI to obtain this information.

An applicant should briefly summarize how the insulation is protected from water intrusion when the LRA includes AMR items for calcium silicate or fiberglass insulation exposed to outdoor air. If the insulated piping is constructed of stainless steel, the applicant should also summarize leachable content testing results. If this detail is missing from the LRA, the staff will likely issue an RAI.

Component Exposed to Steam but Managed with a Treated Water AMR Item

Two applicants stated that their high-pressure coolant injection and reactor core isolation cooling systems included steel components exposed to steam. In one case, the applicant

referenced SRP-LR AMR items associated with a reactor coolant environment. In the other case, the applicant referenced SRP-LR AMR items for steel piping exposed to steam. Neither of the applicants referenced SRP-LR items with flow-accelerated corrosion as an aging mechanism. Although the staff is aware that the high-pressure coolant injection and reactor core isolation cooling systems are infrequently operated, the shorter operating periods do not preclude the loss of material due to flow-accelerated corrosion over a 60-year operating period.

Applicants should provide plant-specific notes justifying why the loss of material due to flow-accelerated corrosion is not an applicable aging effect when steel piping is exposed to steam. In addition, they should ensure that the SRP-LR AMR item environment and the LRA AMR item environment are consistent, or they should provide a plant-specific note justifying the difference. If this information is not provided, the staff will likely issue an RAI requesting the basis for the possible non-consistency with the GALL Report.

Failure to Consider All Applicable Aging Effects

For stainless steel piping exposed to treated water, the GALL Report (e.g., items EP-32, A-58, SP-16) addresses loss of material due to pitting and crevice corrosion. For stainless steel piping exposed to treated water at temperatures greater than 60 degrees C, the GALL Report (e.g., items A-61, SP-17) addresses cracking due to stress-corrosion cracking. In both cases, the GALL Report recommends AMPs XI.M2 and XI.M32 to manage the aging. Some applicants do not address loss of material due to pitting and crevice corrosion as an aging effect when the environment is treated water at temperatures greater than 60 degrees C. The staff prepares an RAI when the applicant does not also address loss of material due to pitting and crevice corrosion. In a related example, copper alloy piping exposed to closed-cycle, treated, or raw water is susceptible to pitting and crevice corrosion, and in some cases microbiologically-influenced corrosion. For copper alloy that is more than 15 percent zinc, the GALL Report (e.g., items RP-12, EP-27) addresses loss of material due to selective leaching and recommends GALL Report AMP XI.M33. However, based on metallurgical references, copper alloy with more than 15 percent zinc is also susceptible to pitting and crevice corrosion. The staff prepares an RAI when the applicant does not also address loss of material due to pitting, crevice corrosion, and microbiologically-influenced corrosion.

Applicants should ensure that, when addressing material types that have additional aging effects due to exposure to a higher temperature environment or different alloying elements, they consider the susceptibility of all of the applicable aging effects. If all of the applicable aging effects are not being managed, the staff will likely issue an RAI.

Insufficient Detail when Using the Generic Terms “Elastomer” and “Polymer”

The GALL Report provides little differentiation among elastomeric and polymeric materials for mechanical systems. The GALL Report tables do not list individual AMR items for specific types of elastomers or polymers.

For mechanical systems, the GALL Report predominantly states that elastomeric components exposed to a range of environments, from raw water to closed cycle cooling water and treated water, and from outdoor air to uncontrolled indoor air, are age-managed for hardening and loss of strength due to elastomer degradation by a periodic or opportunistic program (e.g., AMP XI.M20, “Open-Cycle Cooling Water System,” AMP XI.M36, AMP XI.M38). If the applicant’s program includes visual inspections of the material for evidence of aging effects such as surface cracking, crazing, scuffing, and dimensional changes, and if it includes physical

manipulation (if the component and material are appropriate for manipulation) to detect changes in hardness, the use of the generic terms “elastomer” or “polymer” is sufficient because the staff can conclude that adequate inspections to detect aging are occurring regardless of the specific material. However, when the applicant states that there is no AERM and no AMP is recommended, it should include a plant-specific note. The plant-specific note should state the actual material type or grade (e.g., polyvinyl chloride (PVC), fiberglass-reinforced vinyl ester) and identify environmental considerations that are not obvious from the LRA, FSAR, or license renewal drawings, such as exposure to ultraviolet light, ozone, high temperatures, chemicals, or radiation. The staff requires this information because susceptibility to aging varies widely with the specific material type and environment. For example, plexiglass and PVC are reasonably resistant to heat and light, while polycarbonates can degrade in this environment. Buna-N material is severely affected by ozone, while chlorinated PVC is not.

An applicant should ensure that the appropriate material type details are included in the LRA when it states that no AERM or AMP is applicable for an elastomeric or polymeric component. If this information is missing in the LRA, the staff will likely issue an RAI.

Restrictive Use of the GALL Report System Tables When Claiming Consistency

The GALL Report AMR tables are organized by system or structure/component type. Some applicants have stated that a specific AMR item is not consistent with the GALL Report for a particular system even though the GALL Report addresses the MEAP for a different system. The applicant can claim consistency and cite the alternative system as long as the applicant’s system and the GALL Report alternative system have similar operating parameters (e.g., temperature, flow rate). The staff evaluates every AMR item; however, much less documentation is required for LRA AMR items that cite generic notes A–D than for those that cite generic notes E–J. Therefore, an increased use of appropriate generic notes A–D reduces the resources required to develop the safety evaluation report.

## BACKFIT DISCUSSION

This RIS requires no action or written response. This guidance is directed to future license renewal applicants, particularly those currently preparing an LRA. Any action on the part of addressees to update pending LRAs in accordance with the guidance that appears in this RIS is strictly voluntary. Therefore, this RIS does not constitute a backfit under 10 CFR 50.109, “Backfitting,” and the staff did not perform a backfit analysis.

## *FEDERAL REGISTER* NOTIFICATION

The NRC did not publish a notice of opportunity for public comment on this RIS in the *Federal Register* because the RIS is informational and because the agency presented the purpose and examples of RIS input at a public meeting with NEI on August 17, 2011. A summary of the meeting is available under ADAMS Accession No. ML11256A004.

## CONGRESSIONAL REVIEW ACT

The NRC has determined that this action is not a rule as designated by the Congressional Review Act (5 U.S.C. 801-808) and, therefore, is not subject to the Act.

## PAPERWORK REDUCTION ACT STATEMENT

This RIS contains and references information collection requirements that are subject to the Paperwork Reduction Act of 1995 (44 U.S.C. 3501 et seq.). These information collection requirements were approved by the Office of Management and Budget (OMB), approval numbers 3150-0011 and 3150-0155.

PUBLIC PROTECTION NOTIFICATION

The NRC may not conduct or sponsor, and a person is not required to respond to, a request for information or an information collection requirement unless the requesting document displays a currently valid OMB control number.

## CONTACT

Please direct any questions about this matter to the technical contact listed below.

***/RA by RNelson for/***

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Note: NRC generic communications may be found on the NRC Public Web site, http://www.nrc.gov, under NRC Library/Document Collections.

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