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NPP SUBSEQUENT LICENSE RENEWAL: LESSONS LEARNED FROM AMP EFFECTIVENESS AUDITS

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ABSTRACT

NRC staff recently completed the analysis of first-of-a-kind effectiveness audits of Aging Management Programs (AMPs) at Ginna Nuclear Power Plant (Ginna), Nine Mile Point Nuclear Station, Unit 1 (NMP-1) and H. B. Robinson Steam Electric Plant, Unit 2 (RNP). The staff reviewed the licensee's implementation of the AMPs during the early years of the period of extended operation (PEO), from 40-60 years. This included 29 mechanical system AMPs at Ginna, 30 mechanical system AMPs at NMP-1 and 25 mechanical system AMPs at RNP. Eight structural system AMPs and seven electrical system AMPs each were reviewed at Ginna and NMP-1. At RNP, staff reviewed seven structural system AMPs and six electrical system AMPs. In addition, three AMPs associated with time-limited aging analyses (TLAAs) were reviewed at Ginna and two each at NMP-1 and RNP. The process involved NRC staff conducting onsite interviews with licensee plant personnel, with additional technical experts participating remotely. Among the areas considered by the staff during its audit activities were (1) Inspection accessibility issues, adequacy of inspection methods, and frequency of inspections; (2) Unanticipated structure and component degradation, related equipment failures, or premature repair/replacement; and (3) Trending information that can yield insights regarding the actual effectiveness of the current AMPs and aging management reviews (AMRs). The knowledge obtained from these audits was a primary source enabling the staff to develop new subsequent license renewal guidance documents (SLRGDs), to be used following the first PEO. The existing license renewal guidance documents (LRGDs, such as NUREGs-1800 and-1801) are being significantly revised for subsequent license renewal (SLR).

INTRODUCTION

Title 10 of the Code of Federal Regulations (10 CFR) Part 54, provides rules for renewal of the license of a nuclear power plant (NPP) beyond the initial 40 years for an additional 20 years. This regulation does not preclude a licensee from requesting approval for an additional operating period beyond the 20-year period of extended operation (PEO), and states, in §54.31(d), that "a renewed license may be subsequently renewed." The U.S. NRC is aware that some licensees are considering submitting applications for a subsequent 20-year (presumably) operating period beyond 60 years. The first of these applications could possibly be submitted as early as 2018. To ensure readiness for review of possible applications for SLR, the NRC is developing guidance documents for the technical review of such applications for SLR, i.e., that would authorize plant operation beyond 60 years. The current guidance documents used for the review of license renewal applications (LRAs) for operation up to 60 years are the "Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants" (NUREG-1800) and the Generic Aging Lessons Learned (GALL) Report (NUREG-1801). An important part of this guidance document development activity is the identification of aging effects for systems, structures, and components (SSCs) within the scope of the license renewal rule that would be important to consider for plant operation beyond 60 years, along with the development of AMPs that will be effective in managing the identified aging effects.

To facilitate the development of these guidance documents, the NRC Office of Nuclear Regulatory Research (RES) was tasked by the NRC Office of Nuclear Reactor Regulation (NRR) with identifying and evaluating aging management of SSCs for SLR. Argonne National Laboratory (ANL) provided technical support to the NRC staff to develop guidance documents for technical review of applicant submittals for SLR of NPPs beyond 60 years.

As part of its work to support this guidance document development activity, the NRC conducted "AMP Effectiveness Audits" to provide a more complete understanding of how AMPs have been implemented by plants during the PEO and the degradation that has been identified by the AMPs. The results from these audits provided key information to aid the NRC in identifying needed changes to existing AMPs and new AMPs that may be needed to provide assurance of safe plant operation during an SLR operating period. The scope of these AMP Effectiveness Audits addressed:

- Understanding how the AMPs have been implemented by licensees during the PEO (e.g., the types of component inspections that have been conducted and any access impediments for the inspections).
- Reviewing the findings from the AMPs in terms of the types of degradation that have been identified.
- Identifying how the AMPs have changed based on plant-specific and industry operating experience.

Staff from NRR and RES conducted onsite audits during August/September 2011 at Ginna, during November 2011 at NMP-1, and during January 2013 at RNP (NRC TLR 2013; NRC Letter, 2014). The staff reviewed the licensee's implementation of the AMPs and findings from the AMPs, including confirmatory findings of no degradation as well as adverse or unexpected aging effects. Among the areas considered by the staff during its audit activities were the following:

- Inspection accessibility issues, adequacy of inspection methods, and frequency of inspections.
- Unanticipated structure and component degradation, related equipment failures, or premature repair/replacement.
- Trending information that can yield insights regarding the actual effectiveness of the current AMPs and AMRs.

The auditors reviewed mechanical system AMPs, structural system AMPs and electrical system AMPs. In addition, AMPs associated TLAAs were also reviewed, as applicable. The audit process involved onsite interviews of licensee plant personnel by the staff, with additional participation by telephone by both the staff and, for the mechanical and structural AMPs, ANL staff. The types of information reviewed by the audit team included the following:

- Available results of licensee health reports/assessments of the AMPs.
- Sample results from the nonconformance reporting system related to plant aging.
- Licensee evaluation of site-specific and industry operating experience.
- Changes made to the AMP.
- Any related information about the adequacy of the current AMPs that will assist in the development of guidance for SLR aging management processes and programs.

The AMP effectiveness audits at Ginna, NMP-1, and RNP enabled the staff to add to its knowledge base and provided valuable information to consider in developing guidance documents for SLR (NRC TLR, 2013; Hull et al, 2012). The compiled information was evaluated and successfully identified:

- Effects of aging that need to be managed during an SLR operating period.
- Changes to existing AMPs to improve their performance during the SLR operating period.
- New AMPs that need to be added for the SLR operating period.

This short review article provides examples of documentation of this pilot effort by providing information on the staff's observations from audits for mechanical systems, and structures. Specifically, this paper addresses, as representative examples, lessons learned from the AMP XI.M27 "Fire Water System" and the AMP XI.S8 "Protective Coatings Monitoring and Maintenance."

LICENSE RENEWAL PROCESS

Recent presentations (Hull and Diercks, 2011; Hull et al, PLiM 2012) reviewed the history of nuclear power plant (NPP) license renewal in the U.S. Other earlier documents discussed the evolution of LRGD organization and methodology (Dozier et al, 2005; Hull, et al 2005). The existing 99 licensed, operating commercial NPPs were granted 40-year licenses on the basis of economic and antitrust considerations -- not technical limitations. As global energy needs continue to grow, nuclear power generation will continue to be a critical component in the mix of energy production. There is increasing industry interest in subsequent license renewal and NPP long-term operation (LTO) beyond the first PEO. Extending the operating life of existing NPPs may be, for some utilities, an economically feasible way to meet future energy demands.

The first 40-year operating licenses expired for four NPPs in the year 2009. As of August 1, 2015, operating licenses from 76 units have been renewed and 39 units have entered the first PEO, beyond 40 years. The three plants addressed in this study were among the first five (Table 1) entering into the PEO and thus 20 years later, into the PEO. Vermont Yankee permanently ceased operation on Dec. 29, 2014.

Table 1: The First Fifteen American NPPs into Extended Operation

Nuclear Power Plant & Unit	Entry into Extended Operation	Plant Type
Oyster Creek 1	04/09/2009	BWR-Mark 1-GE2
Nine Mile Point 1	08/22/2009	BWR-Mark 1-GE2
Ginna 1	09/19/2009	PWR-West 2LP
Dresden 2	12/22/2009	BWR-Mark 1-GE3
Robinson 2	07/31/2010	PWR-West 3LP
Monticello 1	09/08/2010	BWR-Mark1 –GE3
Point Beach 1	10/05/2010	PWR-West 2LP
Dresden 3	01/12/2011	BWR-Mark 1-GE3
Palisades 1	03/24/2011	PWR-CE
Vermont Yankee 1	03/21/2012	BWR-Mark 1
Surry 1	05/25/2012	PWR-West 3LP
Pilgrim 1	06/08/2012	BWR-Mark1 –GE3
Turkey Point 3	07/09/2012	PWR-West 3LP
Quad Cities 1	12/14/2012	BWR-Mark1 –GE3
Quad Cities 2	12/14/2012	BWR-Mark1 –GE3

The LRA for Ginna was submitted on August 1, 2002, and the renewed license was issued on May 19, 2004, technically supported by the "Safety Evaluation Report Related to the License Renewal of the R. E. Ginna Nuclear Power Plant," issued as NUREG-1786. Ginna entered the PEO beyond 40 years on September 19, 2009. NMP-1 submitted an LRA on May 27, 2004, and the renewed license was issued on October 31, 2006, technically supported by the "Safety Evaluation Report Related to the License Renewal of Nine Mile Point Nuclear Station, Units 1 and 2," issued as NUREG-1900. NMP-1 entered its PEO on August 22, 2009. RNP submitted an LRA on June 17, 2002, and the renewed license was issued on April 19, 2004, technically supported by the "Safety Evaluation Report Related to the License Renewal of H. B. Robinson Steam Electric Plant, Unit 2", issued as NUREG-1785. RNP entered its PEO on July 31, 2010.

As shown in the above paragraph, the LRAs for Ginna, NMP-1, and RNP were submitted in 2002, 2004, and 2002, respectively. The NRC LRGDs, NUREGs 1800 and 1801, were released in April 2001 (Rev. 0), September 2005 (Rev. 1), and December 2010 (Rev. 2). Thus, the LRAs for Ginna, NMP-1, and RNP were based on the guidance of Revision 0 of NUREG-1800 and Revision 0 of NUREG-1801, and the AMPs for these three plants were generally prepared in conformance with this guidance. Accordingly, there is not a precise correlation between the AMPs currently listed in the latest version of the GALL Report, (NUREG-1801, Rev. 2), and those used and audited at Ginna, NMP-1, and RNP. In addition, because Ginna and RNP are pressurized water reactors (PWR) and NMP-1 is a Mark-1 boiling water reactor (BWR), the applicable AMPs are different for the three plants in some cases. The AMPs reviewed at Ginna include six plant-specific programs not contained in NUREG-1801, Rev. 0, three each related to mechanical and electrical systems, and the NMP-1 AMPs include seven plant-specific programs, two each related to mechanical and structural systems, and three to electrical systems. The AMPs reviewed at RNP included three plant-specific programs, three for mechanical systems and one for structural systems.

Table 2: Key Attributes of Plants Audited for SLR Guidance Document Considerations

Issue	Ginna	NMP-1	Robinson
Reactor Type	West. 2-loop PWR	Mark-1 BWR	West.3-loop PWR
LRA Submitted	8/1/2002	5/27/2004	6/17/2002
License Renewal	5/19/2004	10/31/2006	4/19/2007
SER	NUREG-1786	NUREG-1900	NUREG-1785
Entrance into PEO	9/19/2009	8/22/2009	7/31/2010
AMP Effect. Audit	Aug/Sept 2011	Nov 2011	Jan 2013

Pursuant to 10 CFR 54.31 (a)(3), a license renewal applicant is required to demonstrate that the effects of aging on structures and components subject to an AMR are adequately managed so their intended functions will be maintained consistent with the current licensing basis (CLB) for the PEO. As part of the license renewal process, a licensee must (a) identify all aging effects that potentially could cause degradation of structures and components, and (b) define a comprehensive AMP to manage these aging effects such that the intended function of the structures and components will be maintained during the PEO. The license renewal process is not intended to demonstrate absolute certainty that structures and components will not fail, but rather that there is reasonable assurance that they will consistently maintain functions according to CLB standards.

Table 3: Generic Elements of an Aging Management Program for License Renewal

Element	Description
Program Description	Summary, in no more than a few paragraphs, of the aging effect(s) to be managed, the aging mechanism(s) responsible for the aging effect(s), the overall approach proposed to manage the aging effect(s), and the technical basis for this approach.
1. Scope of Program	Scope of program includes the specific structures and components subject to an AMR for license renewal.
2. Preventive Actions	Preventive actions should prevent or mitigate aging degradation.
3. Parameters Monitored or Inspected	Parameters monitored or inspected should be linked to the degradation of the particular structure or component-intended function(s).
4. Detection of Aging Effects	Detection of aging effects should occur before there is a loss of structure or component-intended function(s). This includes aspects such as inspection method or technique (i.e., visual, volumetric, surface inspection), frequency, sample size, data collection, and timing of new/one-time inspections to ensure timely detection of aging effects.
5. Monitoring and Trending	Monitoring and trending should provide predictability of the extent of degradation, and timely corrective or mitigative actions.
6. Acceptance Criteria	Acceptance criteria, against which the need for corrective action will be evaluated, should ensure that the structure or component-intended function(s) are maintained under all CLB design conditions during the PEO.
7. Corrective Actions	Corrective actions, including root cause determination and prevention of recurrence, should be timely.
8. Confirmation Process	Confirmation process should ensure that preventive actions are adequate and that appropriate corrective actions have been completed and are effective.
9. Administrative Controls	Administrative controls should provide a formal review and approval process.
10. Operating Experience	If the AMP is an existing program, operating experience of the AMP, including past corrective actions resulting in program enhancements or additional programs, should provide objective evidence to support the conclusion that the effects of aging will be managed adequately so that the structure- and component-intended function(s) will be maintained during the PEO.
References	References for AMP citations and to NRC (and other, as appropriate) guidance should provide enough information to apply the above ten elements.

The Branch Technical Position (BTP) RLSB-1 in Appendix A of NUREG-1800 provides a discussion of a generic AMP (Table 3). The RLSB-1 states that there are four types of programs: (i) prevention: precludes the effects of aging (e.g., coating); (ii) mitigation: attempts to slow down the effects of aging (e.g., water chemistry control); (iii) condition monitoring: involves inspection to detect the presence and extent of aging effects (e.g., periodic lSIs); and (iv) performance monitoring: that tests the ability of the structure or component to perform its intended function (e.g., tests the heat transfer capability of heat exchanger tubes). Typically, more than one type of program is implemented to ensure that aging effects are managed adequately. For example, the Fire Water System AMP includes condition monitoring as well as preventive actions.

The GALL Report has undergone two revisions since its first publication in April 2001. The Ginna, NMP-1, and RNP LRAs, as well as those for a number of other plants, were prepared and subsequently evaluated under GALL, Rev. 0, guidance. Several AMPs in GALL, Rev. 0, have been extensively revised in Rev. 2, and other AMPs in Rev. 2 did not exist in Rev. 0. The AMPs contained in different revisions of the GALL Report all follow a common format as shown in Table 3. Each AMP begins with a program description that summarizes the aging effects and their associated aging degradation mechanisms that need to be managed, and the various aging management activities (AMAs) that are recommended in the AMP to adequately manage the aging effects such that the intended functions of the in-scope components will be maintained during the PEO.

GENERIC EVALUATION AND LESSONS LEARNED

The adequacy of each AMP was based on the following four aspects of the program:

1. *Management Activities of the AMP*: As described in NUREG-1800 BTP RLSB-1, a program based solely on detecting structure and component failure should not be considered an effective AMP for license renewal. The adequacy of the program elements to effectively manage aging degradation is assessed on the basis of the adequacy of the following, based on the understanding of the aging degradation process:
   - Condition and/or performance monitoring guidelines, consistent with applicable requirements, to ensure timely detection and characterization of all applicable aging degradation effects;
   - Design modifications (material selection or replacement) to prevent or minimize degradation (e.g., use of materials that are resistant to degradation or coatings to prevent degradation), and operation within defined limits to prevent or minimize degradation (e.g., water chemistry control);
   - Assessment of the potential effects of plant modifications such as extended power uprate (EPU) or replacement of the steam generator or reactor vessel head or in response to NRC generic guidance or regulatory directive, on the AMP; and
   - Evaluation of the observed degradation in accordance with applicable guidelines to assess the effects of degradation on the structural and functional integrity of the SSCs.
2. *Clarity of the Program Description*: Lack of expected performance of an AMP is sometimes not due to inadequacy of the proposed program components or activities, but to a poor or confusing description of the program.
3. *Deviations from the GALL Program (Exceptions/Enhancements)*: The GALL Report provides just one way of implementing an acceptable AMP for managing aging. A licensee may take some exceptions and exclude some components of the GALL AMP or add enhancements to improve the AMP to make it more effective, or the applicant may propose an alternative AMP. Such changes or deviations and their reasons are tracked to determine the need to modify or update the GALL Report to be consistent with industry practice.
4. *Good Practices or Strengths*: Program Element 8 of the AMP describes the "confirmation process" that ensures that preventive actions are adequate and that appropriate corrective actions have been completed and are effective. For example, water chemistry control may be used to minimize corrosion or stress corrosion cracking (SCC) in reactor pressure boundary components exposed to the reactor coolant environment. However, it may be necessary to include a one-time-inspection program to verify that such degradation processes are indeed not occurring or are insignificant. Similarly, when corrective actions are necessary, there should be follow-up activities to confirm that the corrective

actions have been completed, a root cause determination was performed, and recurrence of the aging degradation effect will be prevented. Furthermore, Program Element 9 describes administrative control, which recommends periodic review of operating experience (OE) to identify areas where the AMP may be enhanced or new programs developed. Implementation of such activities is considered a good practice or strength.

Evaluating Results of the AMP Implementation: The effectiveness of an AMP to manage aging effects depends directly on how well it is implemented. Even a comprehensive, well-planned AMP may not be effective in controlling aging effects, if improperly implemented. Therefore, the implementation of the AMP was evaluated by examining "confirmation process" and "administrative control" program elements as well as the OE for the AMP, including past corrective actions, root cause analyses, trending evaluations, or health reports. These documents provide objective means to identify areas that may require procedural changes to improve the capability of the AMP to manage aging effects, or to check whether the licensee has effectively used these documents to modify its AMP or improve implementation of the AMP. As shown in Table 3 above, the NRC staff places great value on aging-related OE in determining and verifying the effectiveness of an AMP, particularly a new AMP. In the current study, aging-related OE was used as a marker for assessing the adequacy of implementation of an AMP.

AMPS FOR MECHANICAL SYSTEMS

The 38 AMPs numbered XI.M1 through XI.M41 in Chapter XI of the GALL Report for mechanical systems were evaluated on the basis of audits at Ginna, NMP-1, and RNP. Program areas in the mechanical AMPs identified for further consideration include better definition of specific AMAs in the program description. Most AMPs in the GALL Report provide a comprehensive management program that typically consists of two or more AMAs such as condition monitoring (i.e., in-service inspection for crack growth, wall-thinning, or loss of material), prevention or mitigation actions (e.g., water chemistry control, or use of materials more resistant to aging degradation), or performance monitoring (e.g., pressure, temperature, radiation, or flow rate monitoring). For a number of AMPs, the program description section in GALL Rev. 2 either failed to provide a clear description of the AMAs being recommended and their significance in managing the aging effects, or if the AMP refers to guidance provided in other industry or NRC documents, codes, or standards, the program description did not include the details regarding the specific guidance being recommended. These are among the items we focused on in developing SLRGDs.

The frequency and methodology of monitoring and inspection are under increased attention for SLR. GALL, Rev. 2 endorses the use of the One-Time Inspection (OTI) AMP (XI.M32) as a means of verifying the effectiveness of the following AMPs prior to PEO, provided the PEO is expected to be equivalent to that in the prior 40 years and no aging effects have been observed. The AMPs XI.M2, "Water Chemistry"; AMP XI.M30, "Fuel Oil Chemistry"; and AMP XI.M39, "Lubricating Oil Analysis," are examples that are used in conjunction with OTI. The One-Time Inspection AMP may be a particularly valuable tool in verifying the continued effectiveness of several AMPs prior to entering LTO in addition to those specifically mentioned in GALL, Rev. 2. These AMPs include XI.M3 ("Reactor Head Closure Stud Bolting"), XI.M10 ("Boric Acid Corrosion"), XI.M17 ("Flow-Accelerated Corrosion"), XI.M18 ("Bolting Integrity"), XI.M27 ("Fire Water System"), XI.M33 ("Selective Leaching"), and XI.M41 ("Buried and Underground Piping and Tanks"), among others. In all cases, a one-time inspection is applicable only if no aging effects have been observed prior to and during the initial period of extended operation prior to SLR. Where aging effects have been observed, periodic inspections will generally be required.

Case Study: XI.M27 "Fire Water Systems"

The Fire Water System (FWS) program is a condition monitoring program that manages aging effects associated with water-based fire protection system components. The audit reports on the assessment of AMP XI.M27 effectiveness from visits to Ginna, NMP-1, and RNP were reviewed to extract relevant information for evaluating the effectiveness or implementation of the AMP. The information was reviewed to identify good practices or strengths of the AMP and potential areas of the AMP that may require further consideration or enhancements for SLR.

It was noted at one plant that tuberculation was observed in fire water branch piping during the flow tests. Tuberculation is a degradation condition that develops on the interior of pipelines due to microbially influenced corrosion (MIC) or due to corrosive materials that are present in the water passing through the pipe. It results in the creation of small, more or less hemispherical lumps (tubercules) on the walls of the pipe, which increase friction loss and reduce flow velocity. The staff noted that the tuberculation found in the FWS appears to be an aging effect that should be considered for inclusion in potential SLR guidance documents, as it was not included in Revisions 0, 1, or 2 of the LRGDs. The licensee indicated that there are repetitive observations of tuberculation and that this is an ongoing issue. Following the AMP effectiveness audits, NRC staff issued LR-ISG-2012-02 related to internal surfaces and corrosion under insulation that suggested revisions to AMPs XI.M27, XI.M29, XI.M36, XI.M38, XI.M42 and included tuberculation as an aging effect. Each element in SLR AMP XI.M27 was rewritten in LR-ISG-2012-02.

Another example of note is in Element 5. The GALL Rev. 2 program element states, "Degradation identified by non-intrusive or visual inspection is evaluated." One site implemented the following commitment prior to the PEO: "Establish an appropriate means of recording, evaluating, reviewing, and trending the results of visual inspections and volumetric testing." NRC staff considered this a good practice. Consequently the Element 5 wording in the AMP XI.M27 for SLR has been clarified to also trend rates of degradation, "*Rates of degradation are trended in order to confirm that the timing of the next inspection will occur before a loss of intended function of an in-scope component.*"

AMPS FOR STRUCTURAL SYSTEMS

The eight AMPs numbered XI.S1 through XI.S8 in Chapter XI of NUREG-1801, one AMP numbered X.S1 in Chapter X, and two plant-specific AMPs, for structures were reviewed. Historically, the AMPs for structures were developed and revised by technical specialists, individuals different than the technical specialists that developed the AMPs for mechanical systems. Consequently the audit teams noticed different strengths and shortcomings in the AMPs during the audits. Auditors observed that several of the elements were characterized by lack of detailed information. It was also observed that in Element 3, "Parameters Monitored or Inspected," that additional parameters were needed. For example, this program element in AMP XI.S4 ("10 CFR 50 Appendix J") states that the parameters to be monitored are leakage rates through containment shells, containment liners, and associated welds, penetrations, fittings, and other access openings. Because the AMP XI.S4 also relies on ASME Section XI, Subsection IWE, and ASME Section XI, Subsection IWL, inspections (ASME, 2004) as explained in AMPS XI.S1 and XI.S2, aging effects such as loss of material due to corrosion, SCC, loss of sealing, elastomer degradation, and loss of leak lightness due to material degradation should also be included in this program element.

Case Study: XI.S8 "Protective Coating Monitoring and Maintenance"

This is an effective program for managing degradation of Service Level I coatings and, consequently, an effective means to manage loss of material due to corrosion of carbon steel structural elements inside containment. The audit reports on the assessment of AMP XI.S8 effectiveness from visits to Ginna, NMP-1, and RNP were reviewed to extract relevant information for evaluating the effectiveness or implementation of the AMP. The information was reviewed to identify good practices or strengths of the AMP and potential areas of the AMP that may require further consideration or enhancements for SLR. The GALL, Rev. 2, XI.S8 program only addresses maintenance of protective coatings inside containment (i.e., Service Level I protective coating). The plant interviewees suggested adding SL-III (Safety Related Coatings Outside of Containment) to the AMP. As stated in Rev. 2 of RG 1.54, Service Level III coatings are used in areas outside the reactor containment where failure could adversely affect the safety function of a safety-related SSC. The result was the creation of a new AMP as described in LR-ISG 2013-01 to encompass Service Level III coatings.

Suggestions were made in the context of Element 4: Detection of Aging Effects. Extended power uprate (EPU) effects (e. g., containment temperature, pressure, pH and radiation dose) should be taken into consideration to ensure the qualification test methods used in the AMP are effective in detecting the aging effects of containment protective coatings.

AMP XI.S8 touches upon but does not discuss in detail the concerns raised in NRC GSI-191, which deals with the clogging of containment emergency core cooling system (ECCS) sumps and its consequences due to debris, including failed coatings, created during a design-basis accident. In response to this audit observation, Element 5 in the proposed SLR AMP XI.S8 clarifies that assessment from periodic inspections and analysis of total amount of degraded coatings in the containment be compared with the total amount of permitted degraded coatings to ensure post-accident operability of the ECCS.

CONCLUSIONS

An assessment of results from currently implemented license renewal AMPs was performed to obtain a better understanding of the phenomena and management of certain materials degradation mechanisms, and to recommend improvements to the AMPs for subsequent license renewal beyond 60 years. A generic evaluation of the information for the various AMPs was performed to identify the good practices or strengths of the AMPs and potential areas of the AMPs that may require further consideration or enhancements for SLR. The potential areas for further consideration associated with the "program description" and the ten program elements of the AMPs, are classified in three aspects of the AMP: (a) management activities, (b) clarity of program description, and (c) deviation from GALL program. The effects of plant modifications on GALL AMPs are also discussed.

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