NEI 14-12 [Revision 0]

Aging Management Program Effectiveness

December 2014

NEI 14-12 [Revision 0]

Nuclear Energy Institute

Aging Management Program Effectiveness

December 2014

Nuclear Energy Institute, 1201 12th Street N. W., Suite 1100, Washington D.C. (202.739.8000)

ACKNOWLEDGEMENTS

This document was prepared by the Nuclear Energy Institute (NEI) License Renewal Aging Management Task Force (LRTF).

NEI Chairperson: Jason Remer

Industry Representatives

Lori Hekking, Duke Energy

Gene Kelly, Exelon Nuclear

Mike Fallon, Constellation Energy

Garry Young, Entergy

Eric Blocher, STARS

Terry Herrmann, Structural Integrity Associates

Gary Peters, NEI

NOTICE

EXECUTIVE SUMMARY

The purpose of this guideline is to provide a standard approach for the self-assessment process for periodically evaluating the effectiveness of aging management programs (AMPs) (as committed to and described in the UFSAR for plants with a renewed license) to ensure on-going program effectiveness and to provide documentation of information useful for subsequent license renewal (SLR) applications.

An aging management program consists of a series of activities based on the format provided in NEI 95-10 "Industry Guideline For Implementing The Requirements of 10 CFR Part 54 – The License Renewal Rule" Table 4.3-1 for managing the effects of aging on components. These programs are described in the UFSAR for plants with a renewed license.

A licensee may use the information from this guideline as a self-assessment *plan* when evaluating the effectiveness of an aging management program. Aging management program (AMP) effectiveness is already continuously evaluated as part of operating experience (OE) review programs (site-specific and industry-wide) and the corrective action program (CAP). Results from these on-going OE reviews and CAP results are integral to the confirmation process, which is an important element of all aging management programs (i.e., element 8 of the 10 elements of aging management programs per NEI 95-10, Table 4.3-1).

The self-assessment guidelines for AMP effectiveness should be integrated with existing site and utility self-assessment procedures and processes. Program strengths and recommendations should be documented in accordance with existing procedures. Deficiencies that may be indicative of ineffectiveness associated with an aging management program element would continue to be addressed using the corrective action program.

Finally, this guideline provides a consistent approach to meet licensing commitments made by license renewal applicants during the process of obtaining a renewed license. This guideline is only applicable to plants that have renewed their original operating license and entered into the period of extended operation (PEO).

TABLE OF CONTENTS

AGING MANAGEMENT PROGRAM EFFECTIVENESS

1. INTRODUCTION AND BACKGROUND

Aging management program effectiveness and the use of operating experience (OE) are increasingly important topics in supporting long term operation. A pilot NRC AMP Effectiveness Audit was performed at R. E. Ginna and Nine Mile Point Nuclear Plants in 2011 (Accession Number: ML13122A007). The results are documented in a May 2013 Report and are being used to refine the NRC approach for future audits, to "widen the knowledge base and enable broader conclusions to be drawn to support the development of guidance documents for SLR". The information will help inform NRC review and guidance development on aging management programs that may be suitable to credit for SLR (Subsequent License Renewal) applications. The following program strengths and good practices were identified during that audit:

1. Periodic assessments such as program health reports and focused self-assessments can contribute to a basis for determining when programs may need adjustment.
2. A robust process for review of OE related to aging management can ensure that AMPs have the proper scope and focus to effectively manage aging.

The following background and key points are incorporated in this NEI Guideline:

- AMP effectiveness is continuously evaluated as part of existing site-specific operating experience and corrective action programs.
- To complement the existing site-specific continuous and periodic self-assessment activities, a standardized self-assessment process is recommended to improve the sharing of industry information collected on AMP effectiveness.
- Existing program and system health administrative controls examine program performance on a periodic and frequent basis
    - Many of these processes are also subject to NRC inspection and audit through its Regulatory Oversight Program (ROP).
    - The guidelines for standardizing AMP effectiveness reviews should be based on the ten program elements (Table 4.3-1 of NEI 95-10, Rev. 6) for consistency.
- This guideline should complement existing site/utility self-assessment procedures (i.e., not duplicate or conflict with existing procedures).
    - Strengths and recommendations should be documented in accordance with existing procedures; Deficiencies indicative of ineffectiveness associated with any program element should be addressed by the corrective action program.
- This guideline is being coordinated with current INPO OE program revision and improvement efforts involving the collection of data on aging management OE.

2. MEASURES OF EFFECTIVENESS – WHAT DOES AN EFFECTIVE AGING MANAGEMENT PROGRAM LOOK LIKE?

2.1 DEFINING EFFECTIVENESS

The following is contained on the NRC License Renewal Website, under frequently asked questions:

How will the NRC assess the efficacy (effectiveness) of aging management programs (AMPs)?

> "In a performance-oriented manner, the inspectors will use performance or implementation results, in addition to probing various aspects of those results. Normally, areas to be pursued based on results would include one or all of the ten AMP program elements defined in the GALL Report, in combination with the historical commitments made, technical adequacy of the implemented programs or procedures (including improper implementation), and review of data and information with respect to meeting the acceptance criteria. In addition, the staff may consider program results from the NRC's operating experience review, in order to assess the overall efficacy of such programs."

2.2 ATTRIBUTES OF EFFECTIVENESS

The overarching measure of effectiveness is that aging effects are managed as needed to ensure loss of intended function does not occur. The following attributes help support this objective:

- Commitments are managed in accordance with NEI 99-04 and NRC RIS 2000-017.
- Aging management program implementing activities are completed as scheduled.
- Industry and site-specific operating experience is routinely evaluated and program adjustments are made as necessary.
- Self-assessments are conducted and program adjustments are made as necessary.
- No significant findings are identified from external assessments (NRC, INPO) or internal audits.

2.3 CONFIRMATION PROCESS

Every aging management program is evaluated for effectiveness as part of existing regulatory commitments and as recommended by NEI 95-10, Rev. 6, and NUREG-1800 Standard Review Plan (SRP), Rev. 2. SRP Branch Technical Position A.1.2.3, "Aging Management Program Elements" describes Element 8, *Confirmation Process,* as central to the ongoing assessment of a program's effectiveness. This is one of ten program elements integral to every program. The description of this element is as follows:

2.3.1 The confirmation process should ensure that preventive actions are adequate and that appropriate corrective actions have been completed and are effective.

2.3.2 The effectiveness of prevention and mitigation programs should be verified periodically.

For example, in managing internal corrosion of piping, a mitigation program (water chemistry) may be used to minimize susceptibility to corrosion. However, it also may be necessary to have a condition monitoring program (ultrasonic inspection) to verify that corrosion is indeed insignificant.

2.3.3 When corrective actions are necessary, there should be follow-up activities to confirm that the corrective actions have been completed, causes are understood, and actions to prevent recurrence implemented.

2.3.4 To preclude repetition of significant conditions adverse to quality, the Confirmation Process element (Element 8) for AMPs consists of follow-up actions to verify that the corrective actions implemented are effective in preventing a recurrence.

2.3.5 In the Appendix of NUREG-1801, "Quality Assurance for Aging Management Programs", it is stated that the license renewal applicant must demonstrate that the effects of aging on structures and components (SC) subject to an aging management review (AMR) will be managed in a manner that is consistent with the CLB of the facility for the period of extended operation. Therefore, those aspects of the AMR process that affect the quality of safety-related SCs are subject to the quality assurance (QA) requirements of Appendix B to 10 CFR Part 50. For non-safety-related SCs subject to an AMR, the existing 10 CFR Part 50, Appendix B, QA program or augmented QA program may be used to address the elements of corrective actions, confirmation process, and administrative controls.

3. IMPLEMENTATION STRATEGY

3.1 Utilities typically employ a graded approach based on safety significance and complexity for program governance and oversight, using health reports, performance indicators (PI's) and self-assessment. This approach has worked well, providing the needed flexibility to ensure cost effective reviews without being overly prescriptive or rule-based.

3.2 The recommended approach to assess effectiveness of aging management programs is:

a) Perform AMP effectiveness reviews in accordance with existing site and utility self-assessment procedures and processes, generally at five year intervals. The reviews could be performed as part of periodic 54.37(b) tasks, special self-assessments, NRC inspection procedure 71003 readiness activities, or normal program health reporting.

b) Use this Guideline in the preparation for and planning of AMP effectiveness reviews.

c) One-time programs will only be assessed once unless industry or site OE indicates a need for further assessment.

d) The performance criteria in Section 4.0 of this Guideline are used to evaluate an aging management program and are derived from NEI 95-10 Table 4.3-1 and SRP Table A.1-1, "Elements of Aging Management Programs for License Renewal".

e) Correlate the performance criteria with one or more of the applicable ten program elements. It is not necessary to evaluate all ten elements; however, particular attention should be focused on the detection of aging effects (element 4), corrective action (element 7), and operating experience (element 10) as a minimum.

f) Use existing site procedures to perform a review of plant-specific and industry operating experience to confirm the effectiveness of aging management programs. The review should be consistent with NEI 14-13, *Use of Industry Operating Experience for Age-Related Degradation and Aging Management Program*s.

g) Use the attributes of effectiveness in Section 2.2 of this Guideline to arrive at a conclusion regarding "effective" (e.g., commitments properly implemented, inspections complete, no loss of function, OE considered, etc.).

h) Ineffective programs or ineffective elements of programs would be addressed in the corrective action program.

i) Document the results of the effectiveness reviews during the period of extended operation (PEO) and maintain as records available for audit and NRC inspection.

j) Use documented results to support preparation of the Subsequent License Renewal Applications, summarizing the effectiveness of AMPs.

4. PERFORMANCE CRITERIA BY ELEMENT

4.1 Scope of Program - Scope includes specific structures and components subject to AMR

a. Procedures and work orders contain appropriate components.
b. For programs that require sample selection, the sample bases are applied consistent with that outlined in the LRA and associated SER.
c. Implementing procedures and work orders are clearly tied to commitments.
d. Additions or deletions to program scope are properly addressed.

4.2 Preventive Actions - Preventive actions should prevent or mitigate the applicable aging effects

a. Identified program enhancements are instituted in implementing procedures.
b. Specific commitments should be verified to be in place (and changes, if any, approved per commitment management procedures).
c. Implementing activities are completed as scheduled and not deferred without adequate technical justification.
d. Preventive measures are appropriate for the applicable degradation mechanisms.

4.3 Parameters Monitored or Inspected - Parameters should be linked to the degradation of the particular structure or component intended function

a. Implementing procedures identify parameters the program monitors.
b. Parameters monitored should be those being controlled to achieve prevention or mitigation of aging effects.
c. When evidence of an aging effect or mechanism is observed, document the extent of the condition.

4.4 Detection of Aging Effects - Detection should occur with sufficient time to implement preventive actions before there is a loss of structure or component-intended function. This includes aspects like technique (i.e., visual, volumetric, surface exam), frequency, sample size, data collection, and timing of new or one-time inspections to ensure timely detection of aging.

a. Inspections and examinations are conducted at appropriate intervals.
b. Aging effects are identified and actions are implemented before loss of intended function.
c. Samples are biased toward locations most susceptible to aging effect of concern and sample size is expanded when degradation is detected in the initial sample.
d. Unexpected results are evaluated and program adjustments are made as warranted.
e. Operating experience is considered in evaluating the appropriateness of technique and frequency and adoption of new (enhanced) techniques as they become available.

4.5 Monitoring and Trending - Monitoring and trending should provide predictability of the extent of degradation, and timely corrective or mitigative actions.

a. Aging effects are monitored and trended such that no loss of intended function occurs.

b. Results are used to establish a rate of degradation in order to confirm that timing of the next scheduled inspection will occur before a loss of intended function.

c. Inspection frequencies are adjusted when warranted.

4.6 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 period of extended operation.

a. Implementing procedures contain acceptance criteria for each parameter monitored or inspected.

b. Acceptance criteria should anticipate *rates* of change and margin to loss of function.

c. Unexpected or new aging mechanisms trigger actions to address extent of condition.

4.7 Corrective Actions - Actions, including cause evaluation and prevention of recurrence, should be timely.

a. Condition reports are generated when program results fail to meet acceptance criteria and upon detection of unexpected significant aging degradation.

b. Cause evaluations are performed per station procedures.

c. Appropriate extent of condition is applied.

d. Prediction of the extent of degradation is used to effect timely preventive actions.

e. Additional preventive actions, monitoring and inspections are stipulated and instituted as necessary.

4.8 Confirmation Process - The process should ensure that preventive actions are adequate and appropriate corrective actions have been completed and are effective.

a. Evaluations are conducted when unexpected conditions of significant aging effects are discovered. The evaluations should address the expected conditions, rates, future inspections, and consideration of the impact on intended functions.

b. Self-assessments are conducted and program improvements instituted as necessary.

c. Recommendations or deficiencies from external assessments should be addressed.

4.9 Administrative Controls - Controls should provide a formal review and approval process.

a. Recommendations or deficiencies from external assessments are being addressed.

b. Commitments are managed in accordance with site procedures.

c. Changes in commitments should be flagged and administrative controls employed.

d. Appropriate documentation is verified in accordance with existing procedures.

4.10 Operating Experience - Following AMP implementation, industry operating experience and plant operating history, including corrective actions, are used to inform AMPs.

a. Industry operating experience is evaluated and program adjustments are made as necessary.

b. Plant-specific operating experience is used to adjust programs as necessary.

5. REFERENCES

1. Standard Review Plan For Review of License Renewal Applications for Nuclear Power Plants — Final Report (NUREG-1800, Revision 2) December 2010.

2. "Summary of Aging Management Program Effectiveness Audits to Inform Subsequent License Renewal: R.E. Ginna Nuclear Power Plant and Nine Mile Point Nuclear Station, Unit 1," (Accession Number: ML13122A007) May 31, 2013.

3. "H.B. Robinson Steam Electric Plant, Unit 2, Aging Management Program Effectiveness Audit," (Accession Number: ML14017A289) August 5, 2014.

4. NEI 95-10, Revision 6, *Industry Guideline for Implementing the Requirements of 10 CFR Part 54 –The License Renewal Rule*, June 2005.

5. License Renewal Interim Staff Guidance LR-ISG-2011-05: "Ongoing Review of Operating Experience (Accession Number ML12044A215), March 2012.

6. NEI 99-04, *Guidelines for Managing NRC Commitment Changes*, July 1999 (Accession Number: ML003680088).

7. NRC Office Instruction LIC-105 (Revision 5): "Managing Regulatory Commitments Made by Licensees to the NRC," September 16, 2013.

8. Inspection Procedure 71003, "Post-Approval Site Inspection for License Renewal," (Adams Accession No. ML082830294).

9. NEI 14-13, *Use of Industry Operating Experience for Age-Related Degradation and Aging Management Programs.*