NEI 94–01
Revision 3-A

NUCLEAR ENERGY INSTITUTE

INDUSTRY GUIDELINE FOR

IMPLEMENTING PERFORMANCE–BASED

OPTION OF 10 CFR PART 50, APPENDIX J

July 2012

REVISION 3-A TO INDUSTRY GUIDELINE FOR IMPLEMENTING PERFORMANCE–BASED OPTION OF 10 CFR PART 50, APPENDIX J

July 2012

ACKNOWLEDGMENTS

This guidance document, Industry Guideline for Implementing Performance–Based Option of 10 CFR 50, Appendix J, NEI 94–01, Revision 3-A, was developed by the Nuclear Energy Institute (NEI) Type A Integrated Leakage Rate Test Interval Extension Task Force. We appreciate the direct participation of the many licensees who contributed to the development of the guideline and the participation of the balance of the industry that reviewed and submitted comments to improve the document clarity and consistency. The dedicated and timely effort of the many Task Force participants, including their management's support of the effort, is greatly appreciated.

NEI also wishes to express its appreciation to the Electric Power Research Institute (EPRI) who devoted considerable time and resources to the development of this revised industry Appendix J guideline.

FOREWORD

The purpose of this guidance, NEI 94-01 is to assist licensees in the implementation of Option B to 10 CFR 50, Appendix J, "Leakage Rate Testing of Containment of Light Water Cooled Nuclear Power Plants". Revision 2-A of NEI 94-01 added guidance for extending Type A Integrated Leak Rate Test (ILRT) surveillance intervals beyond ten years, and this Revision 3-A of NEI 94-01 adds guidance for extending Type C Local Leak Rate Test (LLRT) surveillance intervals beyond sixty months.

EXECUTIVE SUMMARY

This document, NEI-94-01, Revision 3-A describes an acceptable approach for implementing the optional performance-based requirements of Option B to 10 CFR 50, Appendix J and includes provisions for extending Type A ILRT intervals to up to fifteen years. NEI 94-01 has been endorsed by Regulatory Guide 1.163 (September 1995) and NRC Safety Evaluations of June 25, 2008 and June 8, 2012 as an acceptable methodology for complying with the provisions of Option B to 10 CFR Part 50. The regulatory positions stated in Regulatory Guide 1.163 (September 1995) as modified by NRC Safety Evaluations of June 25, 2008 and June 8, 2012 are incorporated in this document. It delineates a performance-based approach for determining Type A, Type B, and Type C containment leakage rate surveillance testing frequencies. Justification of extending test intervals is based on the performance history and risk insights.

This guideline discusses the performance factors that licensees must consider in determining test intervals. It does not address how to perform the tests because these details can be found in existing documents (e.g., ANSI/ANS-56.8-2002).

The performance criterion for Type A tests is a performance leakage rate (as defined in this guideline) of less than $1.0L_{a.}$ Extension of Type A test intervals are allowed based upon two consecutive successful Type A tests and other requirements stated in Section 9.2.3 of this guideline. These additional requirements include supplemental inspections and a confirmatory plant-specific risk impact assessment. Type A testing shall be performed at a frequency of at least once per 15 years. If the Type A performance leakage rate is not acceptable, the performance criterion is not met, and a determination should be performed to identify the cause of unacceptable performance and determine appropriate corrective actions. Once completed, acceptable performance should be reestablished by demonstrating an acceptable performance leakage rate during a subsequent Type A test before resuming operation and by performing another successful Type A test within 48 months following the unsuccessful Type A test. Following these successful Type A tests, the surveillance frequency may be returned to at least once per 15 years.

Extensions of Type B and Type C test intervals are allowed based upon completion of two consecutive periodic as-found tests where the results of each test are within a licensee's allowable administrative limits. Intervals may be increased from 30 months up to a maximum of 120 months for Type B tests (except for containment airlocks) and up to a maximum of 75 months for Type C tests. If the Type B and C test results are not acceptable, the test frequency should be set at the initial test intervals. Once the cause determination and corrective actions have been completed, acceptable performance may be reestablished and the testing frequency returned to the extended intervals as specified in this document.

Containment airlock(s) shall be tested at an internal pressure of not less than P_a prior to a preoperational Type A test. Subsequent periodic tests shall be performed at a frequency of at least once per 30 months. When containment integrity is required, airlock door seals should be tested within 7 days after each containment access. For periods of multiple containment entries where the airlock doors are routinely used for access more frequently than once every 7 days (e.g., shift or daily inspection tours of the containment), door seals may be tested once per 30 days during this time period.

The performance factors that have been identified as important and should be considered in establishing testing intervals include past performance, service, design, safety impact, and cause determination as described in Section 11.3.1.

If a licensee considers extended test intervals of greater than 60 months for Type B or Type C tested components, the review should include the additional considerations of as-found tests, schedule and review as described in Section 11.3.2.

Finally, this document discusses the general requirements for recordkeeping for implementation of Option B to Appendix J.

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PERFORMANCE-BASED OPTION OF 10 CFR PART 50, APPENDIX J"

NUCLEAR ENERGY INSTITUTE

PROJECT NO. 689

1.0 INTRODUCTION

The objective of the topical report (TR) process is, in part, to add value by improving the efficiency of other licensing processes, for example, the process for reviewing license amendment requests from commercial operating reactor licensees. The purpose of the U.S. Nuclear Regulatory Commission (NRC) TR program is to minimize industry and NRC time and effort by providing for a streamlined review and approval of a safety-related subject with subsequent referencing in licensing actions, rather than repeated reviews of the same subject.

A TR is a stand-alone report containing technical information about a nuclear power plant safety topic, which meets the criteria of a TR. A TR improves the efficiency of the licensing process by allowing the NRC staff to review a proposed methodology, design, operational requirements, or other safety-related subjects that will be used by multiple licensees, following approval, by referencing the approved TR. The TR provides the technical basis for a licensing action.

During the review of the Nuclear Energy Institute's (NEI) TR 94-01, Revision 3, the NRC staff found that, in general, the TR meets the objectives of a TR and reinforces previously established NRC regulations and guidelines as noted within this safety evaluation (SE). The NRC has evaluated this TR against the criteria of Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50, and has determined that it does not represent a backfit. Specifically, NRC staff technical positions outlined in this SE are consistent with the aforementioned regulations and established staff positions, while providing more detailed discussion concerning the methodology and data required supporting surveillance testing frequencies. This SE endorses staff positions previously established through licensing actions and interactions with industry.

1.1 Background

In 1995, the NRC amended 10 CFR Part 50, Appendix J, "Primary Reactor Containment Leakage Testing For Water-Cooled Power Reactors," to provide a performance-based Option B for the containment leakage testing requirements. Option B requires that test intervals for Type A, Type B, and Type C testing be determined by using a performance-based approach. Performance-based test intervals are based on consideration of the operating history of the component and resulting risk from its failure. The use of the term "performance-based" in Appendix J to 10 CFR Part 50 refers to both the performance history necessary to extend test intervals as well as to the criteria necessary to meet the requirements of Option B.

Type A tests focus on verifying the leakage integrity of a passive containment structure. Type B and C testing focus on assuring that containment penetrations are essentially leak tight. These tests collectively satisfy the requirements of 10 CFR Part 50, Appendix J, Option B as stated in the Introduction section of Appendix J:

> "The purposes of the tests are to assure that (a) leakage through the primary reactor containment and systems and components penetrating primary containment shall not exceed allowable leakage rate values as specified in the technical specifications (TSs) or associated bases; and (b) periodic surveillance of reactor containment penetrations and isolation valves is performed so that proper maintenance and repairs are made during the service life of the containment, and systems and components penetrating primary containment."

NEI issued NEI 94-01 Revision 0, "Industry Guideline for Implementing Performance-Based Option of 10 CFR 50, Appendix J," on July 26, 1995 (Reference 1). The guidance found in NEI 94-01, Revision 0, provides a performance-based approach for determining Types A, B, and C containment leakage rate surveillance testing frequencies. Per NEI 94-01, Revision 0, the maximum Type A testing shall be performed at a frequency of at least once per 10 years; intervals for Types B and C tests may be increased from 30 months up to a maximum of 120 months (except for containment airlocks).

Regulatory Guide (RG) 1.163, "Performance-Based Containment Leak-Test Program," was issued in September 1995 (Reference 2), after 10 CFR Part 50, Appendix J was revised. RG 1.163 provides guidance on an acceptable performance-based leak-test program, leakage-rate test methods, procedures, and analyses that may be used to comply with the performance-based Option B in 10 CFR Part 50, Appendix J, and endorsed NEI 94-01, Revision 0 subject to certain regulatory positions, with one being:

> "Because of uncertainties… in historical Type C component performance data, and because of the indeterminate time period of three refueling cycles and insufficient precision of programmatic controls described in Section 11.3.2 to address these uncertainties, the guidance provided in Section 11.3.2 for selecting extended test intervals greater than 60 months for Type C tested components is not presently endorsed by the NRC staff."

Option B, in concert with RG 1.163 and NEI TR 94-01, Revision 0, allows licensees with a satisfactory integrated leak rate testing (ILRT) performance history (i.e., two consecutive, successful Type A tests) to reduce the test frequency for the Type A containment ILRT from three tests in 10 years to one test in 10 years. This relaxation was based on an NRC risk assessment contained in NUREG-1493, "Performance-Based Containment Leak-Test Program" (Reference 3), and the Electric Power Research Institute (EPRI) document TR-104285, "Risk Impact Assessment of Revised Containment Leak Rate Testing Intervals" (Reference 4), both of which showed that the expected risk increase associated with extending the ILRT surveillance interval was very small.

In 2001, the NEI initiated a project to justify further reduction of the ILRT test frequency from one test in 10 years to one test in 20 years based on performance history and risk insights. In view of the time required to develop, approve, and promulgate generic guidance material, the

NEI tasked the EPRI to develop interim guidance to licensees for developing uniform risk assessments supporting one-time extensions of the ILRT surveillance interval to 15 years (i.e., a test frequency of one test in 15 years). The NEI disseminated the interim guidance/methodology to licensees in November 2001 (References 5 and 6). Licensees have subsequently used this methodology as the technical basis to support risk-informed, performance-based, one-time ILRT interval extensions to 15 years at approximately 75 operating reactors. The NRC approved these extensions through routine plant-specific license amendment requests.

In December 2003, the NEI submitted draft NEI TR 94-01, Revision 1, and EPRI Report No. 1009325, Revision 0, to support an industry effort to extend the ILRT surveillance interval to 20 years. The technical basis for the 20-year extension relied heavily on the use of new containment leakage probability values developed through an expert elicitation conducted by EPRI. Following the NRC staff's identification of a number of concerns regarding the expert elicitation, EPRI subsequently withdrew EPRI Report No. 1009325, Revision 0.

By letter dated December 19, 2005, the NEI submitted NEI TR 94-01, Revision 1, "Industry Guideline for Implementing Performance-Based Option of 10 CFR Part 50, Appendix J," and EPRI Report No. 1009325, Revision 1, December 2005, "Risk Impact Assessment of Extended Integrated Leak Rate Testing Intervals" (Reference 7) for NRC staff review. EPRI Report No. 1009325, Revision 1, provided a generic assessment of the risks associated with a more limited, permanent performance-based extension of the ILRT surveillance interval to 15 years, and a risk-informed methodology/template to be used by licensees to confirm the risk impact of the ILRT extension on a plant-specific basis. The methodology is substantially similar to the NEI interim guidance/methodology, with minor enhancements to reflect experience from the analyses and reviews of one-time ILRT extensions and to reflect additional leak rate data from 35 recently completed ILRTs.

By letter dated February 21, 2007 (Reference 8), the NRC staff submitted a request for additional information (RAI) identifying information needed to continue the review. By letter dated May 25, 2007 (Reference 9), the NEI submitted its RAI responses. Because of the RAI responses, NEI TR 94-01, Revision 1, and EPRI Report No. 1009325, Revision 1, were revised to address NRC staff comments and recommendations. By letter dated August 31, 2007, the NEI submitted TR 94-01, Revision 2, "Industry Guideline For Implementing Performance-Based Option of 10 CFR Part 50, Appendix J," and EPRI Report No. 1009325, Revision 2, August 2007, "Risk Impact Assessment of Extended Integrated Leak Rate Testing Intervals" (Reference 10), to the NRC staff for review.

NEI TR 94-01, Revision 2, describes an approach for implementing the optional performance-based requirements of Option B described in 10 CFR Part 50, Appendix J, which includes provisions for extending Type A ILRT intervals up to 15 years and incorporates the regulatory positions stated in RG 1.163. It delineates a performance-based approach for determining Type A, Type B, and Type C containment leakage rate surveillance testing frequencies. This method uses industry performance data, plant-specific performance data, and risk insights in determining the appropriate testing frequency. NEI TR 94-01, Revision 2, also discusses the performance factors that licensees must consider in determining test intervals. However, it does not address how to perform the tests because these details can be found in existing documents (e.g., ANSI/ANS-56.8-2002) (Reference 11).

EPRI Report No. 1009325, Revision 2, provides a risk impact assessment for optimized ILRT intervals of up to 15 years, utilizing current industry performance data and risk-informed guidance, primarily Revision 1 of RG 1.174, "An Approach for using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Licensing Basis" (Reference 12).

By letter dated June 25, 2008 (Reference 13), the NRC staff issued a SE for NEI TR 94-01, Revision 2, and companion EPRI Report No. 1009325, Revision 2. The SE documents the NRC staff's evaluation and acceptance of NEI TR 94-01, Revision 2, and EPRI Report No. 1009325, Revision 2, subject to the limitations and conditions identified in the SE and summarized in Section 4.0 of the June 25, 2008 SE.

The staff requested NEI to publish an approved version of NEI TR 94-01, which would incorporate the SE. As a result, NEI TR 94-01, Revision 2-A, "Industry Guideline for Implementing Performance Based Option of 10 CFR 50, Appendix J," was issued in October 2008 (Reference 14) by NEI.

NEI identified a concern with the grace period for testing the Type C components as described in NEI TR 94-01, Revision 2-A and by letter dated September 2, 2009 (Reference 15), the NEI submitted NEI TR 94-01, Revision 2-A Supplement 1, "Industry Guideline for Implementing Performance Based Option of 10 CFR 50, Appendix J," for NRC staff review. NEI TR 94-01, Revision 2-A Supplement 1 requested that the NRC staff approve a return to the original wording contained in the previous version of NEI TR 94-01. Based on several conference calls held with the NEI, the NRC staff noted a difference in understanding between the NEI and the NRC staff as to the intent and use of the grace period contained in the original wording.

The NRC staff's position in this regard is contained in RG 1.163 as stated above and in the final rule published in the "Federal Register/Vol. 60, No. 186/Tuesday, September 26, 1995/Rules and Regulations" (60FR49495) regarding the risk-informed regulation based on the performance history of components (containment, penetrations, valves) as a means to justify an increase in the interval for Type A, B, and C tests:

> "Type B & Type C Test Interval (1) Allow local leakage-rate test (LLRTs) intervals to be established based on the performance history of each component; (2) the performance criterion for the tests will continue to be the allowable leakage rate (La); (3) Specific performance factors for establishing extended test intervals (up to 10 years for Type B components, and 5 years for Type C components) are contained in the regulatory guide and industry guideline. In the regulatory guide, the NRC has taken exception to the NEI guideline allowing the extension of Type C test intervals up to 10 years, and limits such extension to 5 years."
>
> "In establishing the 5-year test interval for LLRTs, the NRC has designed a cautious, evolutionary approach as data are compiled to minimize the uncertainty now believed to exist with respect to LLRT data. The NRC's judgment, based on risk assessment and deterministic analysis, continues to be that the limited data base on unquantified leakages and common mode repetitive failures introduces significant uncertainties into the probabilistic risk analysis. The NRC will be open to submittals from licensees as more performance-based data are developed. The extension of LLRT test interval to

> 5 years is a prudent first step. By allowing a 25 percent margin in testing frequency requirements, the NRC has provided the flexibility to accommodate longer fuel cycles."

Based on the above, the NRC staff's view is that the original intent was that tests were not supposed to be scheduled automatically using the interval plus grace period to routinely stretch the interval to the next refueling outage after the sixty months (5 years) allowed interval. The NEI position expressed in their September 2, 2009, letter was that the original intent was that the grace period allowed a permanent interval extension for plants on a 24-month cycle to test every third refuel outage.

By letter dated December 3, 2009 (Reference 16), the NRC staff submitted a RAI identifying information needed to continue review. By letter dated March 29, 2011 (Reference 17), the NEI submitted a package that included three attachments: (1) RAI responses from the December 3, 2009, letter as well as other responses made to comments identified during several conference call interactions; (2) an interim report on a project initiated by EPRI to collect and analyze recent (since 1996)Type C LLRT performance data; and (3) a proposed Revision 3 to NEI TR 94-01, "Industry Guideline for Implementing Performance Based Option of 10 CFR 50, Appendix J."

After receiving comments from the NRC staff in a letter dated April 21, 2011 (Reference 18), NEI submitted NEI TR 94-01, Revision 3, in a letter dated June 9, 2011 (Reference 19).

1.2 Purpose

This SE documents the NRC staff's evaluation and acceptance of NEI TR 94-01, Revision 3, subject to the limitations and conditions identified in Section 4 of this SE and summarized in Section 5.0.

NEI TR 94-01, Revision 3, includes guidance for extending Type C LLRT surveillance intervals beyond sixty months. Section 3.0 of this SE provides the NRC staff position on the adequacy of NEI TR 94-01, Revision 3, in addressing the performance-based Type C test frequencies.

The NRC staff reviewed NEI TR 94-01, Revision 3, to determine whether its guidance will provide reasonable assurance that Type C local leak rate testing at an extended periodicity will ensure that Type C components maintain their intended functions during the period of extended operation. The review also considered compliance with regulatory requirements in 10 CFR Part 50.

1.3 Organization of the Safety Evaluation

Section 2.0 of this SE summarizes the regulatory position. Section 3.0 documents the staff's technical evaluation and findings pertaining to the adequacy of NEI TR 94-01, Revision 3. In particular, Section 3.0 documents any staff concerns with the TR and the basis for limitations and conditions being placed on the use of the TR by applicants/licensees who choose to implement the NRC-approved version of NEI TR 94-01, Revision 3. Section 4.0 summarizes the limitations and conditions. Section 5.0 provides the conclusions resulting from this SE.

2.0 REGULATORY EVALUATION

The regulation at 10 CFR 50.54(o), requires primary reactor containments for water-cooled power reactors to be subject to the requirements of Appendix J to 10 CFR Part 50, "Leakage Rate Testing of Containment of Water Cooled Nuclear Power Plants." Appendix J specifies containment leakage testing requirements, including the types of tests required to ensure the leak-tight integrity of the primary reactor containment and systems and components that penetrate the containment. In addition, Appendix J discusses leakage rate acceptance criteria, test methodology, frequency of testing, and reporting requirements for each type of test.

In 1995, the NRC amended the regulations to provide an Option B to the 10 CFR Part 50, Appendix J. Option B requires that test intervals for Type A, Type B, and Type C testing be determined by using a performance-based approach. Performance-based test intervals are based on consideration of operating history of the component and resulting risk from its failure. Performance-based for Appendix J refers to both the performance history necessary to extend test intervals as well as the criteria necessary to meet the requirements of Option B.

Type A tests focus on verifying the leakage integrity of a passive containment structure. Type B and C testing focuses on assuring that containment penetrations are essentially leak tight. These tests collectively satisfy the requirements of 10 CFR Part 50, Appendix J, Option B summarized as follows: "These test requirements ensure that (a) leakage through these containments or systems and components penetrating these containments does not exceed allowable leakage rates specified in the Technical Specifications and (b) integrity of the containment structure is maintained during its service life."

NEI TR 94-01, Revision 3, provides guidance for implementing the Appendix J performance-based requirements and incorporates, by reference, the provisions of ANSI/ANS-56.8-2002 and the requirements of Subsections IWE and IWL of Section XI of the American Society of Mechanical Engineers (ASME) Boiler & Pressure Vessel Code (Code) (References 20 and 21). The ASME Code requirements are incorporated by reference in 10 CFR 50.55a, with modifications and limitations. The modifications and limitations vary in accordance with the edition and the addenda of the ASME Code as required by 10 CFR 50.55a.

3.0 TECHNICAL EVALUATION

3.1 Type C Containment Isolation Valve Performance

In order to reduce the uncertainty and thereby allow for increasing the allowable extended interval, NEI obtained LLRT leak-tight performance data from industry (29 units) in order to validate the risk impact assessment of EPRI TR-104285, "Risk Impact Assessment of Revised Containment Leak Rate Testing Intervals," August 1994 (Reference 22). NEI states that with this validated assessment, it justifies increasing allowable extended LLRT intervals to the 120 months specified in NEI 94-01, Revision 0. However, NEI is requesting that the allowable extended interval for Type C LLRTs be increased only to 75 months, to be conservative (also as a "cautious evolutionary approach"), with a permissible extension (for non-routine emergent conditions) of nine months (84 months total). **See Limitation and Condition #1.**

NEI collected data covering the period of 1996-2010 for leak-tight performance of Type C containment isolation valves on extended intervals and presented them in EPRI Report

No. 1022599, "Type C Containment Isolation Valve Performance," January 2011 (Reference 23). This report concludes that the leak-tight performance of Type C containment isolation valves tested on extended intervals after 1995 is significantly better than the leak-tight performance of the general population of Type C valves tested before 1995. This report shows that the failure rate for valves tested on extended intervals (after implementation of NEI 94-01 in 1995) was about an order of magnitude less than that reported in EPRI TR-104285 and in NUREG-1493 for the general population of valves tested before the 1995 time frame.

A failure is defined as a valve exceeding its administrative leakage limit as defined in Section 10.2 of NEI 94-01, which requires administrative limits be established and maintained in accordance with ANSI/ANS-56.8-2002, Sections 6.5 and 6.5.1. The staff has determined that these requirements, including those for periodic review (e.g., maintenance) provide sufficient guidance and assurance for compliance. The reported instances of exceeding administrative limits (failures) on redundant valves were only 4.7 percent of the reported failures, which is a very small number; as is the pathway leakage rate, and in no case was the 0.6La criterion exceeded.

As referred to in NEI 94-01, EPRI TR-104285 provided a risk impact assessment of alternative testing intervals for both ILRT and LLRT. Risk involved in conducting Type C LLRTs on extended intervals (using population dose as the metric) was determined using valve leakage performance data obtained from industry by the NEI. This pre-1995 data was very conservatively applied in the risk impact assessment by assuming that the leakage magnitude for a penetration would be that associated with the valve in the penetration that exceeded its administrative limit. As stated above, the recent (post-1995) failure rate data indicates that the failure rate of Type C valves tested on extended intervals was significantly less than the failure rate for the general population of Type C valves tested pre-1995. NEI states that this 1994 risk impact assessment remains conservative and valid based on the application of this recent data to assess the risk involved with testing valves that qualify for testing on extended intervals in accordance with NEI 94-01. The NRC staff agrees.

During a preliminary review of the EPRI TR-1022599, the NRC staff concluded that the EPRI focus was on LLRT individual "failures" (each plant's staff determines what leakage value results in a "failure" for each of their valves) with little attention to how close units operate to the 0.6 La combined Type B and C TS leakage criterion. The staff was concerned how this may incorrectly result in a condition for desired routine scheduling of Type C tests beyond 60 months, and may result in an understatement of the min-pathway total. To address the staff's concern, Section 12.1, "Report Requirements," of NEI TR 94-01, was revised in Revision 3 to require that the post-outage report shall include the margin between the Type B and Type C leakage rate summation and its regulatory limit. It further states that adverse trends in the Type B and Type C leakage rate summation shall be identified in the report and a corrective action plan developed to restore the margin to an acceptable level. The NRC staff finds the revision to Section 12.1, "Report Requirements," of NEI TR 94-01, Revision 3 to be acceptable with the condition identified in Section 4.0 of this SE. **See Limitation and Condition #2.**

3.2 NRC Staff Evaluation of NEI TR 94-01, Revision 3

The purpose of NEI TR 94-01, Revision 3, is to assist licensees in the implementation of Option B to 10 CFR Part 50, Appendix J, and in extending Type C LLRT intervals beyond 60 months. Specifically, NEI TR 94-01, Revision 3, includes guidance that would permit licensees to permanently extend the Type C LLRT surveillance intervals to 75 months. It delineates a performance-based approach for determining Type A, Type B, and Type C containment leakage rate testing frequencies. The failure of any Type C tests would reset the testing frequency back to 30 months until performance history is re-established.

The reactor containment leakage test program includes performance of an ILRT, also termed as a Type A test; and performance of LLRTs, also termed as either Type B or Type C tests. The Type A test measures the overall leakage rate of the primary reactor containment. Type B tests are intended to detect leakage paths and measure leakage rates for primary reactor containment penetrations. Type C tests are intended to measure containment isolation valve leakage rates.

Sections 3.2.1 through 3.2.3 of this SE provide the NRC staff's evaluation of the adequacy of NEI TR 94-01, Revision 3, for addressing the performance-based Type C test frequencies.

3.2.1 Performance-Based Type C Test (LLRT) Frequencies

Individual licensees may adopt a testing interval and approach provided that certain performance factors and programmatic controls are reviewed and applied as appropriate. The performance factors that have been identified as important, and that should be considered in establishing testing intervals, include past performance, service design, safety impact, and cause determination. A licensee should develop bases for new frequencies based upon satisfactory performance of leakage tests that meet the requirements of 10 CFR Part 50, Appendix J. Additional considerations used to determine appropriate frequencies may include service life, environment, past performance, design, and safety impact.

3.2.2 Type C Performance Leakage Rate

Leakage rates less than the administrative leakage rate limits are considered acceptable to the NRC staff. Administrative limits for leakage rates shall be established, documented, and maintained for each Type C component prior to the performance of LLRT in accordance with the guidance provided in ANSI/ANS-56.8-2002, Sections 6.5 and 6.5.1. Administrative limits are specific to individual penetrations or valves, and not the surveillance acceptance criteria for Type C tests. Acceptance criteria for the combined leakage rate for all penetrations subject to Type C testing should be defined in accordance with ANSI/ANS-56.8-2002, Sections 6.4 and 6.5.

3.2.3 Extending Type C Test Intervals

The regulation at 10 CFR Part 50, Appendix J, states that Type C tests shall be performed prior to initial reactor operation. In accordance with the guidance in NEI TR 94-01, Revision 3, subsequent periodic Type C tests shall be performed at a frequency of at least once per 30 months, until adequate performance history is established. Extensions of Type C test intervals are allowed based upon completion of two consecutive periodic as-found tests where the results of each test are less than a licensee's allowable administrative limits.

NEI TR 94-01, Revision 3 (page iv, Executive Summary) states that: "Intervals may be increased from 30 months… up to a maximum of 75 months for Type C tests… If a licensee considers extended test intervals of greater than 60 months for… Type C tested components, the review should include the additional considerations of as-found tests, schedule and review... If the Type C test results are not acceptable, the test frequency should be set at the initial test intervals. Once the cause determination and corrective actions have been completed, acceptable performance may be reestablished and the testing frequency returned to the extended intervals...."

NEI TR 94-01, Revision 3, Section 10.2.3.3 (Type C testing) stipulates that the performance of these tests shall be performed at a frequency of at least once per 30 months if a penetration is replaced or engineering judgment determines that modification of a penetration has invalidated the valve's performance history; and that testing shall continue at this frequency until an adequate performance history is established.

NEI TR 94-01, Revision 3, Section 10.1, states that the: "intervals of up to 75 months for the recommended surveillance frequency for... Type C testing given in this section may be extended by up to 25 percent of the test interval, not to exceed nine months." The NRC staff agrees with this extension as being consistent with scheduling practices for TS.

3.3 The Impact of the Proposed Change Should be Monitored Using Performance Measurement Strategies

As documented in NUREG-1493, industry experience has shown that most ILRT failures result from leakage that is detectable by local leakage rate testing (Type B and C testing). Specific testing frequencies for the LLRT are reviewed prior to every refueling outage. An outage scope document is issued to document the LLRT periodically and to ensure that all pre-maintenance and post-maintenance testing is complete.

The post-outage report provides a written record of the extended testing interval changes and the reasons for the changes based on testing results and maintenance history. Based on the above measures, the LLRT program will provide continuing assurance that the most likely sources of leakage will be identified and repaired.

ANSI/ANS-56.8-2002, Section 6.4.4, also specifies surveillance acceptance criteria for Type B and Type C tests and states that: "The combined [as-found] leakage rate of all Type B and Type C tests shall be less than 0.6La when evaluated on a minimum pathway leakage rate basis, at all times when containment operability is required." It states, moreover, that: "The combined leakage rate for all penetrations subject to Type B and Type C test shall be less than or equal to 0.6La as determined on a maximum pathway leakage rate basis from the as-left LLRT results." These combined leakage rate determinations shall be done with the latest leakage rate test data available, and shall be kept as a running summation of the leakage rates. The combined leakage rate determination should also be incorporated in every post-outage report.

The containment components' monitoring and maintenance activities will be conducted according to the requirements of 10 CFR Part 50, Appendix J, and 10 CFR Part 50.55a.

The above provisions are considered acceptable performance monitoring strategies for assuring that the risk of the proposed change will remain small.

4.0 LIMITATIONS AND CONDITIONS

The NRC staff finds that the guidance in NEI 94-01, Revision 3, is acceptable for referencing by licensees in the implementation for the optional performance-based requirements of Option B to 10 CFR Part 50, Appendix J. However, the NRC staff identified two conditions on the use of NEI 94-01, Revision 3:

1. NEI TR 94-01, Revision 3, is requesting that the allowable extended interval for Type C LLRTs be increased to 75 months, with a permissible extension (for non-routine emergent conditions) of nine months (84 months total). The staff is allowing the extended interval for Type C LLRTs be increased to 75 months with the requirement that a licensee's post-outage report include the margin between the Type B and Type C leakage rate summation and its regulatory limit. In addition, a corrective action plan shall be developed to restore the margin to an acceptable level. The staff is also allowing the non-routine emergent extension out to 84-months as applied to Type C valves at a site, with some exceptions that must be detailed in NEI 94-01, Revision 3. At no time shall an extension be allowed for Type C valves that are restricted categorically (e.g. BWR MSIVs), and those valves with a history of leakage, or any valves held to either a less than maximum interval or to the base refueling cycle interval. Only non-routine emergent conditions allow an extension to 84 months. **This is Topical Report Condition 1.**

2. The basis for acceptability of extending the ILRT interval out to once per 15 years was the enhanced and robust primary containment inspection program and the local leakage rate testing of penetrations. Most of the primary containment leakage experienced has been attributed to penetration leakage and penetrations are thought to be the most likely location of most containment leakage at any time. The containment leakage condition monitoring regime involves a portion of the penetrations being tested each refueling outage, nearly all LLRT's being performed during plant outages. For the purposes of assessing and monitoring or trending overall containment leakage potential, the as-found minimum pathway leakage rates for the just tested penetrations are summed with the as-left minimum pathway leakage rates for penetrations tested during the previous 1 or 2 or even 3 refueling outages. Type C tests involve valves which, in the aggregate, will show increasing leakage potential due to normal wear and tear, some predictable and some not so predictable. Routine and appropriate maintenance may extend this increasing leakage potential. Allowing for longer intervals between LLRTs means that more leakage rate test results from farther back in time are summed with fewer just tested penetrations and that total used to assess the current containment leakage potential. This leads to the possibility that the LLRT totals calculated understate the actual leakage potential of the penetrations. Given the required margin included with the performance criterion and the considerable extra margin most plants consistently show with their testing, any understatement of the LLRT total using a 5-year test frequency is thought to be conservatively accounted for. Extending the LLRT intervals beyond 5 years to a 75-month interval should be similarly conservative provided an estimate is made of the potential understatement and its acceptability determined as part of the trending specified in NEI 94-01, Revision 3, Section 12.1.

   When routinely scheduling any LLRT valve interval beyond 60-months and up to 75-months, the primary containment leakage rate testing program trending or monitoring must include an estimate of the amount of understatement in the Type B & C total, and must be included in a licensee's post-outage report. The report must include the reasoning and determination of the acceptability of the extension, demonstrating that the LLRT totals calculated represent the actual leakage potential of the penetrations. **This is Topical Report Condition 2.**

5.0 CONCLUSIONS

The NRC staff reviewed NEI TR 94-01, Revision 3, and determined that it describes an acceptable approach for implementing the optional performance-based requirements of Option B to 10 CFR Part 50, Appendix J, as modified by the conditions and limitations summarized in Section 4.0 of this SE. This guidance includes provisions for extending Type C LLRT intervals up to 75 months. Type C testing ensures that individual containment isolation valves are essentially leak tight. In addition, aggregate Type C leakage rates support the leakage tightness of primary containment by minimizing potential leakage paths.

The NRC staff, therefore, finds that this guidance, as modified to include two limitations and conditions, is acceptable for referencing by licensees proposing to amend their TS in regards to containment leakage rate testing. Any applicant may reference NEI TR 94-01, Revision 3, as modified by this SE and approved by the NRC, in a licensing action to satisfy the requirements of Option B to 10 CFR Part 50, Appendix J. The NRC staff is not required to repeat its review of the matters described in the TR conditioned upon the changes described in this SE (Sections 3 and 4) to be incorporated when the report appears as a reference which was complied with a request for relief, or other related licensing actions.

Before endorsement by the NRC, the TR must be updated to reflect the correction of the issues described in Sections 3 and 4, and incorporation of both limitations and conditions, into the body of the TR.

6.0 REFERENCES

The following reports and supporting information were used by the staff as part of its review of the NEI TR 94-01, Revision 3.

1. NEI TR 94-01, Revision 0, "Industry Guideline for Implementing Performance-Based Option of 10 CFR Part 50, Appendix J, July 26, 1995" (ADAMS Legacy Library Accession No. 9510200180).

2. U.S. Nuclear Regulatory Commission, "Performance-Based Containment Leak-Test Program," Regulatory Guide 1.163, September 1995 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML003740058).

3. U.S. Nuclear Regulatory Commission, "Performance-Based Containment Leak-Test Program," NUREG-1493, July 1995.

4. Electric Power Research Institute, "Risk Impact Assessment of Revised Containment Leak Rate Testing Intervals," Report No. 104285, Palo Alto, California, August 1994.

5. A. R. Pietrangelo, NEI, memorandum to NEI Administrative Points of Contact, November 13, 2001.

6. A. R. Pietrangelo, NEI, memorandum to NEI Administrative Points of Contact, November 30, 2001.

7. A. R. Pietrangelo, NEI, letter to Document Control Desk, U.S. Nuclear Regulatory Commission, December 19, 2005 (ADAMS Package Accession No. ML053610177).

8. T. M. Mensah, U.S. Nuclear Regulatory Commission, letter to J. H. Riley, NEI, February 21, 2007 (ADAMS Accession No. ML062910258)

9. J. C. Butler, NEI, letter to T. M. Mensah, U.S. Nuclear Regulatory Commission, May 25, 2007 (ADAMS Package Accession No. ML071590201).

10. J. C. Butler, NEI, letter to T. M. Mensah, U.S. Nuclear Regulatory Commission, August 31, 2007 (ADAMS Package Accession No. ML072970204).

11. American Nuclear Society, "Containment System Leakage Testing Requirements," ANSI/ANS 56.8-2002, LaGrange Park, Illinois.

12. U.S. Nuclear Regulatory Commission, "An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Licensing Basis," Regulatory Guide 1.174, Revision 1, November 2002 (ADAMS Accession No. ML023240437.

13. M. J. Maxin, U.S. Nuclear Regulatory Commission, letter to J. C. Butler, NEI, June 25, 2008 (ADAMS Accession No. ML081140151).

14. NEI TR 94-01, Revision 2-A, "Industry Guideline for Implementing Performance Based Option of 10 CFR 50, Appendix J, October 2008".

15. J. H. Riley, NEI, letter to T. M. Mensah, U.S. Nuclear Regulatory Commission, September 2, 2009 (ADAMS Accession No. ML0925803830).

16. T. M. Mensah, U.S. Nuclear Regulatory Commission, letter to J. H. Riley, NEI, December 3, 2009 (ADAMS Accession No. ML093340541).

17. B. Bradley, NEI, letter to S. D. Stuchell, U.S. Nuclear Regulatory Commission, March 29, 2011.

18. S. D. Stuchell, U.S. Nuclear Regulatory Commission, letter to B. Bradley, NEI, April 21, 2011.

19. B. Bradley, NEI, letter to S. D. Stuchell, U.S. Nuclear Regulatory Commission, June 9, 2011.

20. American Society of Mechanical Engineers, *Boiler and Pressure Vessel Code*, Section XI, Subsection IWE, "Requirements for Class MC and Metallic Liners of Class

CC Components of Light-Water Cooled Plants."

21. American Society of Mechanical Engineers, *Boiler and Pressure Vessel Code*, Section XI, Subsection IWL, "Requirements for Class CC Concrete Components of Light-Water Cooled Plants."

22. EPRI TR-104285, "Risk Impact Assessment of Revised Containment Leak Rate Testing Intervals, August 1994."

23. EPRI report No. 1022599, "Type C Containment Isolation Valve Performance, January 2011."

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Date: May 8, 2012

NEI 94-01, REVISION 3-A

Industry Guideline for Implementing Performance – Based Option of 10 CFR 50, Appendix J

July 2012

1.0 INTRODUCTION

1.1 Background

Containment leakage rate testing is performed in accordance with 10CFR50, Appendix J, "Leakage Rate Testing of Containment of Light Water Cooled Nuclear Power Plants." Appendix J specifies containment leakage testing requirements, including the types of tests required. In addition, for each type of test, Appendix J discusses leakage rate acceptance criteria, test methodology, frequency of testing, and reporting requirements. The specific testing requirements are discussed in a variety of sources, including Technical Specifications, Containment Leakage Rate Testing Program, Final Safety Analysis Reports (FSARs), National Standards (e.g., ANSI/ANS-56.8–2002, "Containment System Leakage Testing Requirements"), and licensee/NRC correspondence. These documents require that periodic testing be conducted to verify the leakage integrity of the containment and those containment systems and components that penetrate the containment.

The reactor containment leakage test program includes performance of an Integrated Leakage Rate Test (ILRT), also known as a Type A test; and performance of Local Leakage Rate Tests (LLRTs), also known as either Type B or Type C tests. The Type A test measures overall leakage rate of the primary reactor containment. Type B tests are intended to detect leakage paths and measure leakage for certain primary reactor containment penetrations. Type C tests are intended to measure containment isolation valve leakage rates.

In 1995, the NRC amended the regulations to provide an Option B to the 10CFR50, Appendix J. Option B is a performance–based approach to Appendix J leakage testing requirements. This option, in concert with NEI 94-01, allows licensees with good ILRT performance history to reduce the Type A Integrated Leakage Rate Test (ILRT) frequency from three tests in 10 years to at least one test in 15 years. The initial 1995 relaxation of ILRT frequency was based on the NRC risk assessment contained in "Performance-Based Containment Leak-Test Program (NUREG-1493) and EPRI Risk Impact Assessment of Revised Containment Leak Rate Testing Intervals (TR-104285) both of which found that there was a very low increase in risk associated with increasing ILRT surveillance intervals to ten years. Furthermore, the NRC assessment stated that there was an imperceptible increase in risk associated with increasing ILRT intervals up to twenty years.

In 2001, many licensees began to submit requests for one-time ILRT interval extensions beyond ten years, and it was deemed appropriate to assess the risk involved in extending ILRT intervals beyond ten years. EPRI Product No. 1018243, "Risk Impact Assessment of Extended Integrated Leak Rate Testing Intervals" demonstrated that generally there is little risk associated with extension of ILRT intervals of up to fifteen years. However, plant-specific confirmatory risk impact assessments are required. Moreover, pragmatic considerations require an assessment of the overall integrity of the containment, including Type A integrated leak rate testing at fifteen-year intervals.

For Type B and Type C tests, 10CFR50, Appendix J, Option B, in concert NEI 94-01 allows licensees to reduce testing frequency on a plant–specific basis based on experience history of each component, and established controls to ensure continued performance during the extended testing interval.

Regulatory Guide 1.163 (September 1995) endorsed NEI 94-01 Revision 0 as an acceptable methodology for complying with the provisions of Option B to 10 CFR Part 50 with some limitations. NEI 94-01 Revision 0 provided for testing of Type C containment isolation valves at extended intervals up to 120 months. Regulatory Guide 1.163 limited testing Type C containment isolation valves on extended intervals to 60 months, and NEI 94-01 Revision 2A reflected the 60-month limitation. Recent Type C containment isolation valve performance data contained in EPRI Report 1022599, "Type C Containment Isolation Valve Performance", January 2011 has validated the risk impact assessment of EPRI-TR 104285 for Type C containment isolation valve extended intervals. This revision 3-A of NEI 94-01 provides for testing of Type C containment isolation valves on extended intervals of up to 75 months.

Generally, a FSAR describes plant testing requirements, including containment testing. In some cases, FSAR testing requirements differ from those of Appendix J. In many cases, Technical Specifications were approved that incorporated exemptions to provisions of Appendix J. Additionally, some licensees have requested and received exemptions after their Technical Specifications were issued. The alternate performance–based testing requirements contained in Option B of Appendix J will not invalidate such exemptions. However, any exemptions to the provisions of 10CFR50, Appendix J to be maintained in force as part of the Containment Leakage Testing Program should be clearly identified as part of the plant's program documentation.

Plants that have elected to invoke 10CFR50, Appendix J, Option B in concert with NEI 94-01 (1995) and Regulatory Guide 1.163 (1995) and who do not wish to extend ILRT surveillance intervals beyond ten years, including ten years with a one-time extension of the interval up to fifteen years are not required to comply with this revision or subsequent revisions of NEI 94-01.

1.2 Discussion

This guideline describes an approach that may be used to meet the alternate testing requirements described in 10CFR50, Appendix J, Option B. The performance history of containment, penetrations, and containment isolation valves is used as the means to justify extending test intervals for containment Type A, Type B, and

Type C tests. This guideline provides a method for determining the extended test intervals based on performance.

Under Option B, test intervals for Type A, Type B, and Type C testing may be determined by using a performance–based approach. Performance–based test intervals are based on consideration of operating history of the component and resulting risk from its failure. Performance–based for Appendix J refers to both the performance history necessary to extend test intervals as well as the criteria necessary to meet the requirements of Option B. The performance–based approach to leakage rate testing discussed in NUREG–1493, "Performance–Based Leak–Test Program," concludes that the impact on public health and safety due to extended intervals is negligible. EPRI Product No. 1018243, "Risk Impact Assessment of Extended Integrated Leak Rate Testing Intervals" concludes that reducing the frequency of Type A tests (ILRTs) from the baseline (3 per 10 years) to 1 per 15 years leads to a small increase in risk. The approach of the EPRI Risk Impact Assessment included compliance with appropriate current risk-informed guidance of Regulatory Guide 1.174, Revision 1 (2002), "An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions in Plant-Specific Changes to the Licensing Basis."

Type A tests focus on verifying the leakage integrity of a passive containment structure. Type B and C testing focuses on assuring that containment penetrations are essentially leak tight. These tests collectively satisfy the requirements of 10CFR50, Appendix J, Option B summarized as follows: "These test requirements ensure that (a) leakage through these containments or systems and components penetrating these containments does not exceed allowable leakage rates specified in the Technical Specifications and (b) integrity of the containment structure is maintained during its service life."

2.0 PURPOSE AND SCOPE

This guideline describes an acceptable method for implementing the optional performance–based requirements of Appendix J. This method uses industry performance data, plant–specific performance data, and risk insights in determining the appropriate testing frequency. Licensees may elect to use other suitable methods or approaches to comply with Option B, but must obtain NRC approval prior to implementation.

The approach described in this guideline to implement Appendix J, Option B includes:

- Continued assurance of the leakage integrity of the containment without adversely affecting public health and safety;

- A framework to acknowledge good performance;

- Utilization of risk and performance–based methods, including an awareness of the plant-specific risk impact of extension of ILRT intervals of up to fifteen years;

- An awareness of and attention to supplemental means of assessing and maintaining containment integrity, particularly for ILRT interval extensions beyond ten years. Specifically, this includes the Maintenance Rule and ASME Boiler and Pressure Vessel Code, Section XI, Subsections IWE/IWL inspections and

- Licensee flexibility to implement cost–effective testing methods.

This guideline delineates the basis for a performance–based approach for determining Type A, Type B, and Type C containment leakage rate surveillance testing frequencies. It does not address how to perform the tests because these details can be found in existing documents (e.g., ANSI/ANS-56.8–2002) that are endorsed for use. However, some differences exist between ANSI/ANS-56.8-2002, and this document, NEI 94-01. Where differences exist, NEI 94-01, Revision 3-A takes precedence.

3.0 RESPONSIBILITY

Each licensee should determine if the requirements of the initial 10CFR50, Appendix J (Option A) or the alternate requirements (Option B) are most appropriate for its facility. If a licensee elects to implement the Option B requirements, the guidance described in this document has been reviewed and endorsed by the NRC as an acceptable method of implementing the requirements.

In addition, if a licensee elects to adopt Option B, it may elect to adopt the requirements that apply to a specific category of tests (i.e., Type A, or Type B and Type C tests) only.

Plants that have elected to adopt 10CFR50, Appendix J, Option B in concert with NEI 94-01 (1995) and Regulatory Guide 1.163 (1995) and who do not wish to extend ILRT surveillance intervals beyond ten years, including ten years with a one-time extension of the interval up to fifteen years are not required to comply with this revision or subsequent revisions of NEI 94-01.

4.0 APPLICABILITY

This guideline is applicable to licensees holding an operating license issued in accordance with 10 CFR 50.21(b) and 50.22, and 10 CFR Part 52, Subpart C.

Industry operating experience and plant modifications that may affect Type A, Type B, and Type C testing program(s) should be reviewed to assure test and maintenance programs are appropriately adjusted to reflect these changes.

5.0 DEFINITIONS

Definitions of most commonly accepted terms used in this guideline may be found in ANSI/ANS-56.8–2002. The following additional term and its definition is used in this guideline:

- The **performance leakage rate** is calculated as the sum of the Type A upper confidence limit (UCL) and as–left minimum pathway leakage rate (MNPLR) leakage rate for all Type B and Type C pathways that were in service, isolated, or not lined up in their test position (i.e., drained and vented to containment atmosphere) prior to performing the Type A test. In addition, leakage pathways that were isolated during performance of the test because of excessive leakage must be factored into the performance determination. The performance criterion for Type A tests is a performance leak rate of less than 1.0La.

6.0 GENERAL REQUIREMENTS

10CFR50, Appendix J, Option B states: "Type A tests to measure the containment system overall integrated leakage rate must be conducted under conditions representing design basis loss-of-coolant accident containment peak pressure. A Type A test must be conducted (1) after the containment system has been completed and is ready for operation and (2) at a periodic interval based on the historical performance of the overall containment system as a barrier to fission product releases to reduce the risk from reactor accidents. A general visual inspection of the accessible interior and exterior surfaces of the containment system for structural deterioration which may affect the containment leak-tight integrity must be conducted prior to each test, and at a periodic interval between tests based on the performance of the containment system. The leakage rate must not exceed the allowable leakage rate (La) with margin, as specified in the Technical Specifications. The test results must be compared with previous results to examine the performance history of the overall containment system to limit leakage."

A review of leakage rate testing experience indicates that only a small percentage of Type A tests have exhibited excessive leakage. Furthermore, the observed leakage rates for the few Type A test failures were only marginally above current limits. These observations, together with the insensitivity of public risk to containment leakage rate at these low levels, suggest that for Type A tests, intervals may be established based on performance. The Type A test is the primary means to detect containment leakage that is not detectable by the Type B and Type C testing programs, and is also used to verify at periodic intervals the accident leakage (L_a) assumptions in the accident analysis.

An LLRT is a test performed on Type B and Type C components. An LLRT is not required for the following cases:

- Primary containment boundaries that do not constitute potential primary containment atmospheric pathways during and following a Design Basis Accident (DBA);

- Boundaries sealed with a qualified seal system; or,

- Test connection vents and drains between primary containment isolation valves which are one inch or less in size, administratively secured closed and consist of a double barrier.

For Type B and Type C tests, intervals shall be established based on the performance history of each component. Performance criterion for each component is determined by designating an administrative leakage limit for each component in the Type B and Type C testing program in accordance with guidance provided in Sections 6.5 and 6.5.1 of ANSI/ANS-56.8-2002. The acceptance criteria for Type B and Type C tests is based upon demonstrating that the sum of leakage rates at DBA pressure for containment penetrations and valves that are testable, is less than the total allowable leakage rate specified in the plant Technical Specifications.

Primary containment barriers sealed with a qualified seal system shall be periodically tested to demonstrate their functionality in accordance with the plant Technical Specifications. Specific details of the testing methodology and requirements are contained in ANSI/ANS-56.8–2002 and should be adopted by licensees with applicable systems. Test frequency may be set using a performance basis in a manner similar to that described in this guideline for Type B and Type C test intervals. Leakage from containment isolation valves that are sealed with a qualified seal system may be excluded when determining the combined leakage rate provided that:

- Such valves have been demonstrated to have fluid leakage rates that do not exceed those specified in the technical specifications or associated bases, and
- The installed isolation valve seal-water system fluid inventory is sufficient to assure the sealing function for at least 30 days at a pressure of 1.10 Pa.

7.0 UTILIZATION OF EXISTING PROGRAMS

Licensees should use existing industry programs, studies, initiatives and data bases, where possible.

8.0 TESTING METHODOLOGIES FOR TYPE A, B AND C TESTS

Type A, Type B and Type C tests should be performed using the technical methods and techniques specified in ANSI/ANS-56.8–2002, or other alternative testing methods that have been approved by the NRC.

All Appendix J pathways must be properly drained and vented during the performance of the ILRT in accordance with Section 3.2.5 of ANSI/ANS-56.8-2002.

It should be noted that the Type B or C tests performed on associated pathways must test all of its containment barriers. This includes bonnets, packings, flanged joints, threaded connections, and compression fittings. If the Type B or C test pressurizes any of the pathway's containment barriers in the reverse direction, it must be shown that test results are not affected in a non-conservative manner by directionality. The as–found and the as–left leakage rate for all pathways that are not drained and vented must be determined by Type B and Type C testing within the previous 30 calendar months of the time that the Type A test is performed and must be added to the Type A leakage rate UCL to determine the overall L_a surveillance acceptance criteria in accordance with the definition in Section 5.0 of this document.

For purposes of determining an acceptable Type A test for operability considerations, the as-found overall integrated leakage rate shall be determined. The as-found overall integrated leakage rate shall be calculated by adding the following quantities to the Type A UCL:

(1) The positive differences between the as-found MNPLR and the as-left MNPLR for each pathway tested and adjusted prior to the ILRT (savings), and
(2) The as-found MNPLR of all leakage paths isolated during the performance of the ILRT.

Note: Because of the performance–based emphasis on Type A testing, present criteria for Type A tests have been defined differently than in the previous ANSI/ANS-56.8-1994. The present criteria, the performance leakage rate (defined in Section 5), is not the same as the aforementioned as-found integrated leakage rate, and does not use the leakage savings value.

If a pathway is isolated during performance of an ILRT due to excessive leakage, and the pathway leakage can be determined by a local leakage rate test, the as–left

MNPLR for that leakage path must also be added to the Type A UCL. If the pathway leakage cannot be determined by local leakage rate testing, the performance criteria for the Type A test were not met. If an excessively leaking containment penetration barrier pathway is discovered during the Type A test, and the pathway is neither a Type B or a Type C tested pathway, it shall still be tested to Type B or Type C test requirements after the Type A test and its as-left MNPLR added to the Type a test UCL. In this case the Type A test performance criterion is not met unless that pathway is subsequently added to the Type B or Type C test program. If the excessive leakage is from a source that can be tested only during a Type A test, the Type A test performance criterion is not met.

ANSI/ANS-56.8–2002, Section 6.4.4 also specifies surveillance acceptance criteria for Type B and Type C tests, and states that the combined (as-found) leakage rate of all Type B and Type C tests shall be less than 0.6La when evaluated on a MNPLR basis at all times when containment operability is required. Moreover, the combined leakage rate for all penetrations subject to Type B and Type C tests shall be less than or equal to 0.6La as determined on an MXPLR basis from the as-left LLRT results. This (MXPLR) criterion is only required to be met prior to entering a mode where containment integrity is required following a refueling outage or following a shutdown that included Type B or Type C testing. These combined leakage rate determinations shall be performed with the latest leakage rate test data available, and shall be kept as a running summation of the leakage rates.

9.0 DETERMINING PERFORMANCE–BASED TEST INTERVAL FOR TYPE A TESTS

9.1 Introduction

Determination of the surveillance frequency of Type A tests is based upon satisfactory performance of leakage tests that meet the requirements of Appendix J. Performance in this context refers to both the performance history necessary to determine test intervals as well as overall criteria needed to demonstrate leakage integrity performance. Performance is also used as a basis for demonstrating negligible impact on public health and safety.

The purpose of Type A testing is to verify the leakage integrity of the containment structure. The primary performance objective of the Type A test is not to quantify an overall containment system leakage rate. The Type A testing methodology as described in ANSI/ANS-56.8–2002, and the modified testing frequencies recommended by this guideline, serves to ensure continued leakage integrity of the containment structure. Type B and Type C testing assures that individual penetrations are essentially leak tight. In addition, aggregate Type B and Type C leakage rates support the leakage tightness of primary containment by minimizing potential leakage paths. A review of performance history has concluded that almost all containment leakage is identified by local leakage rate testing.

This section discusses a method to determine a testing frequency for Type A testing based on performance. The extended test interval is based upon industry performance data that was compiled to support development of Option B to Appendix J, and is intended for use by any licensee. In adopting extended test intervals recommended in this guideline, a licensee should perform Type A testing in accordance with recommended industry practices.

Required surveillance intervals for recommended Type A testing given in this section may be extended by up to 9 months to accommodate unforeseen emergent conditions, but should not be used for routine scheduling and planning purposes.

9.1.1 Performance Criteria

Performance criteria for establishing Type A test intervals should provide both the standard against which performance is to be measured and basis for determining that performance is acceptable.

The performance criterion for Type A test allowable leakage is a performance leakage rate of less than $1.0L_a$. This allowable performance leakage rate is calculated as the sum of the Type A UCL and as–left MNPLR leakage rate for all Type B and Type C pathways that were in service, isolated, or not lined up in their test position (i.e., drained and vented to containment atmosphere) prior to performing the Type A test. In addition, leakage pathways that were isolated during performance of the test because of excessive leakage must be factored into the performance determination. If the leakage can be determined by a local leakage rate test, the as– left MNPLR for that leakage path must also be added to the Type A UCL. If the pathway leakage cannot be determined by local leakage rate testing, the performance criteria are not met.

If an excessively leaking containment penetration barrier pathway is discovered during the Type A test, and the pathway is neither a Type B or a Type C tested pathway, it shall still be tested to Type B or Type C test requirements after the Type A test and its as-left MNPLR added to the Type a test UCL. In this case the Type A test performance criterion is not met unless that pathway is subsequently added to the Type B or Type C test program. If the excessive leakage is from a source that can be tested only during a Type A test, the Type A test performance criterion is not met.

Failure of Type B and Type C test components found during performance of a Type A test should be reviewed for cause determination and corrective actions. If the pathway leakage cannot be determined by local leakage rate testing, the Type A performance criteria are not met.

9.1.2 Test Interval

Extensions in test intervals are allowed based upon two consecutive, periodic successful Type A tests and requirements stated in Section 9.2.3 of this guideline. The elapsed time between the first and the last tests in a series of consecutive passing tests used to determine performance shall be at least 24 months.

9.2 Type A Test

9.2.1 Pretest Inspection and Test Methodology

Prior to initiating a Type A test, a visual examination shall be conducted of accessible interior and exterior surfaces of the containment system for structural problems that may affect either the containment structure leakage integrity or the performance of the Type A test. This inspection should be a general visual inspection of accessible interior and exterior surfaces of the primary containment and components. It is recommended that these inspections be performed in conjunction or coordinated with the ASME Boiler and Pressure Vessel Code, Section XI, Subsection IWE/IWL required examinations.

ANSI/ANS-56.8-2002 testing methodology states that pathways open to the primary containment atmosphere under post–DBA conditions shall be drained and vented to the primary containment atmosphere during a Type A test. There are four exceptions discussed in ANSI/ANS-56.8-2002 that allow penetrations to be tested under the LLRT program and the results added to the Type A leakage rate Upper Confidence Limit (UCL). One exception states that pathways in systems that are required for proper conduct of the Type A test or to maintain the plant in a safe condition during the Type A test may be operable in their normal mode. Proper outage planning should identify systems that are important to shutdown safety. A sufficient number of systems should be available so as to minimize the risk during the performance of the Type A test.

For planning and scheduling purposes, or ALARA considerations, licensees may want to consider not venting and draining additional penetrations that are capable of local leakage rate testing.

9.2.2 Initial Test Intervals

A preoperational Type A test shall be conducted prior to initial reactor operation. If initial reactor operation is delayed longer than 36 months after completion of the preoperational Type A test, a second preoperational Type A test shall be performed prior to initial reactor operations.

The first periodic Type A test shall be performed after commencing reactor operation and within 48 months after the successful completion of the last preoperational Type A test. Periodic Type A tests shall be performed at a frequency of at least once per 48 months, until acceptable performance is established in accordance with Section 9.2.3. Each test interval begins upon completion of a Type A test and ends at the start of the next test.

If the test interval ends while primary containment integrity is either not required or it is required solely for shutdown activities, the test interval may be extended indefinitely. However, a successful Type A test shall be completed prior to entering the operating mode requiring primary containment integrity.

9.2.3 Extended Test Intervals

Type A testing shall be performed during a period of reactor shutdown at a frequency of at least once per 15 years based on acceptable performance history. Acceptable performance history is defined as successful completion of two consecutive periodic Type A tests where the calculated performance leakage rate was less than 1.0 L_a. A preoperational Type A test may be used as one of the two Type A tests that must be successfully completed to extend the test interval, provided that an engineering analysis is performed to document why a preoperational Type A test can be treated as a periodic test. Elapsed time between the first and last tests in a series of consecutive satisfactory tests used to determine performance shall be at least 24 months.

For purposes of determining an extended test interval, the performance leakage rate is as defined in Section 5.0 and repeated here for completeness: The performance leakage rate is calculated as the sum of the Type A upper confidence limit (UCL) and as–left minimum pathway leakage rate (MNPLR) leakage rate for all Type B and Type C pathways that were in service, isolated, or not lined up in their test position (i.e., drained and vented to containment atmosphere) prior to performing the Type A test. In addition, leakage pathways that were isolated during performance of the test because of excessive leakage must be factored into the performance determination. If the pathway leakage can be determined by a local leakage rate test, the as–left MNPLR for that leakage path must also be added to the Type A UCL. If the pathway leakage cannot be determined by local leakage rate testing, the performance criteria for the Type A test are not met. If an excessively leaking containment penetration barrier pathway is discovered during the Type A test, and the pathway is neither a Type B or a Type C tested pathway, it shall still be tested to Type B or Type C test requirements after the Type A test and its as-left MNPLR added to the Type A test UCL. In this case the Type A test performance criterion is not met unless that pathway is subsequently added to the Type B or Type C test program. If the excessive leakage is from a source that can be tested only during a Type A test, the Type A test performance criterion is not met.

In reviewing past performance history, Type A test results may have been calculated and reported using computational techniques other than the Mass Point method from ANSI/ANS-56.8–2002 (e.g., Total Time or Point–to–Point). Reported test results from these previously acceptable Type A tests can be used to establish the performance history. Additionally, a licensee may recalculate past Type A UCL (using the same test intervals as reported) in accordance with ANSI/ANS-56.8–2002 Mass Point methodology and its adjoining Termination criteria in order to determine acceptable performance history. In the event where previous Type A tests were performed at reduced pressure (as described in 10 CFR 50, Appendix J, Option A), at least one of the two consecutive periodic Type A tests shall be performed at peak accident pressure (P_a).

9.2.3.1 General Requirements for ILRT Interval Extensions beyond Ten Years

Type A ILRT intervals of up to fifteen years are allowed by this guideline. The Risk Impact Assessment of Extended Integrated Leak Rate Testing Intervals, EPRI report 1018243 indicates that, in general, the risk impact associated with ILRT interval extensions for intervals up to fifteen years is small. However, plant-specific confirmatory analyses are required. In addition, although the historical containment leak-tight performance has been very good, a few instances of degradation have occurred and have been detected by supplemental means other than Type A ILRTs. These means include visual examinations, ASME Boiler and Pressure Vessel Code Section XI, Subsection IWE/IWL examinations and Maintenance Rule inspections. The following paragraphs summarize the additional requirements for extending ILRT intervals beyond ten years.

9.2.3.2 Supplemental Inspection Requirements

To provide continuing supplemental means of identifying potential containment degradation, a general visual examination of accessible interior and exterior surfaces of the containment for structural deterioration that may affect the containment leak-tight integrity must be conducted prior to each Type A test and during at least three other outages before the next Type A test if the interval for the Type A test has been extended to 15 years. It is recommended that these inspections be performed in conjunction or coordinated with the ASME Boiler and Pressure Vessel Code, Section XI, Subsection IWE/IWL required examinations.

9.2.3.3 Deficiencies Identified During Supplemental Inspections

Deficiencies identified during supplemental inspections or at any time between Type A ILRTs should be included in the plant's corrective action program and a determination should be performed to identify the cause of the deficiency and determine appropriate corrective actions. The determination should include whether the deficiency is a local, one-time occurrence or if it could be more pervasive, and whether it is isolable in accordance with the discussion of Section 9.2.3 regarding penetration pathways. If the deficiency constitutes a non-isolable leakage pathway (for example, through-wall liner corrosion), the as-found leakage must be quantified and should be added to the as-left performance leak rate determined in the last ILRT. If the combination of these leak rates exceed La, then the containment performance has degraded, and the unit should be removed from an extended ILRT interval, if applicable, and corrective action pursued in accordance with Section 9.2.6.

9.2.3.4 Plant-Specific Confirmatory Analyses

To provide plant-specific assurance of the acceptability of the risk impact of extending ILRT intervals up to a maximum of fifteen years, a confirmatory risk impact assessment is required. The assessment should be performed using the approach and methodology described in EPRI Report 1018243, "Risk Impact Assessment of Extended Integrated Leak Rate Testing Intervals". The analysis is to be performed by the licensee and retained in the plant documentation and records as part of the basis for extending the ILRT interval.

9.2.4 Containment Repairs and Modifications

Repairs and modifications that affect the containment leakage integrity require local leakage rate testing or short duration structural tests as appropriate to provide assurance of containment integrity following the modification or repair. This testing shall be performed prior to returning the containment to operation.

9.2.5 Surveillance Acceptance Criteria

The as–found Type A test leakage rate must be less than the acceptance criterion of 1.0 L_a given in the plant Technical Specifications. Prior to entering a mode where containment integrity is required, the as–left Type A leakage rate shall not exceed 0.75 L_a. The as–found and as–left values are as determined by the appropriate testing methodology specifically described in ANSI/ANS-56.8–2002.

9.2.6 Corrective Action

If the Type A performance leakage rate is not acceptable, the performance criterion is not met, and a determination should be performed to identify the cause of unacceptable performance and determine appropriate corrective actions. Once completed, acceptable performance should be reestablished by demonstrating an acceptable performance leakage rate during a subsequent Type A test before resuming operation and by performing another successful Type A test within 48 months following the unsuccessful Type A test. Following these successful Type A tests, the surveillance frequency may be returned to at least once per 15 years.

10.0 DETERMINING PERFORMANCE–BASED TEST FREQUENCIES FOR TYPE B AND TYPE C TESTS

10.1 Introduction

This section discusses the method to determine extended test intervals for Type B and Type C tests based on performance. It presents a range of acceptable intervals based upon industry data that have been analyzed through a process similar to that used by NRC in NUREG–1493, and have been reviewed for safety significance. Individual licensees may adopt a testing interval and approach as discussed in this guideline provided that certain performance factors and programmatic controls are reviewed and applied as appropriate. Programmatic controls may be necessary to ensure that assumptions utilized in analysis of the industry data are reasonably preserved at individual facilities.

The range of recommended frequencies for Type B and Type C tests are discussed in Section 11.0. The proposed frequencies are in part based upon industry performance data that was compiled to support the development of Option B to Appendix J, and a review of their safety significance. A licensee should develop bases for new frequencies based upon satisfactory performance of leakage tests that meet the requirements of Appendix J. Additional considerations used to determine appropriate frequencies may include service life, environment, past performance, design, and safety impact. Additional technical information concerning the data may be found in NUREG–1493.

Consistent with standard scheduling practices for Technical Specifications Required Surveillances, intervals of up to 120 months for the recommended surveillance frequency for Type B testing and up to 75 months for Type C testing given in this section may be extended by up to 25 percent of the test interval, not to exceed nine months.
Notes: For routine scheduling of tests at intervals over 60 months, refer to the additional requirements of Section 11.3.2.

Extensions of up to nine months (total maximum interval of 84 months for Type C tests) are permissible only for non-routine emergent conditions. This provision (nine month extension) does not apply to valves that are restricted and/or limited to 30 month intervals in Section 10.2 (such as BWR MSIVs) or to valves held to the base interval (30 months) due to unsatisfactory LLRT performance.

10.2 Type B and Type C Testing Frequencies

The testing interval for each component begins after its Type B or Type C test is completed and ends at the beginning of the next test. If the testing interval ends while primary containment integrity is not required or is required solely for cold shutdown or refueling activities, testing may be deferred; however, the test must be completed prior to the plant entering a mode requiring primary containment integrity.

Leakage rates less than the administrative leakage rate limits are considered acceptable. Administrative limits for leakage rates shall be established, documented, and maintained for each Type B and Type C component prior to the performance of local leakage rate testing in accordance with the guidance provided in ANSI/ANS-56.8-2002, Sections 6.5 and 6.5.1. The administrative limits assigned to each component should be specified such that they are an indicator of potential valve or penetration degradation. Administrative limits for airlocks may be equivalent to the surveillance acceptance criteria given for airlocks in Technical Specifications.

Administrative limits are specific to individual penetrations or valves, and are not the surveillance acceptance criteria for Type B and Type C tests. Due to the performance–based nature of Option B to Appendix J and this guideline, the acceptance criteria for the combined leakage rate for all penetrations subject to Type B or Type C testing shall be defined in accordance with ANSI/ANS-56.8-2002, Section 6.4.4. ANSI/ANS-56.8–2002, Section 6.4.4 states that the combined (as-found) leakage rate of all Type B and Type C tests shall be less than 0.6La when evaluated on a MNPLR (minimum pathway) basis at all times when containment operability is required. Moreover, the combined leakage rate for all penetrations subject to Type B and Type C tests shall be less than or equal to 0.6La as determined on MXPLR (maximum pathway) basis from the as-left LLRT results. This (MXPLR) criterion is only required to be met prior to entering a mode where containment integrity is required following a refueling outage or following a shutdown that included Type B or Type C testing. These combined leakage rate determinations shall be performed with the latest leakage rate test data available, and shall be kept as a running summation of the leakage rates. Also, the requirements of Section 11.3.2 apply for valves on extended intervals greater than 60 months.

The surveillance acceptance criteria for airlocks are as specified in Technical Specifications, and administrative limits do not apply. In addition, there is other leakage rate testing specified in the Technical Specifications that contain Surveillance Acceptance Criteria and Surveillance Frequencies, for example, vent and purge valves and BWR main steam and feedwater isolation valves. This guideline does not address the performance–based frequency determination of those surveillances.

If no plant-specific technical specifications are in effect for BWR and PWR containment purge and vent valves and/or BWR main steam and feedwater isolation valves, the interval for Type C tests should be limited to 30 months.

10.2.1 Type B Test Intervals

10.2.1.1 Initial Test Intervals (Except Containment Airlocks)

Type B tests shall be performed prior to initial reactor operation. Subsequent periodic Type B tests shall be performed at a frequency of at least once per 30 months, until acceptable performance is established per Section 10.2.1.2.

10.2.1.2 Extended Test Intervals (Except Containment Airlocks)

The test intervals for Type B penetrations may be increased based upon completion of two consecutive periodic as–found Type B tests where results of each test are within a licensee's allowable administrative limits. Elapsed time between the first and last tests in a series of consecutive satisfactory tests used to determine performance shall be 24 months or the nominal test interval (e.g., refueling cycle) for the component prior to implementing Option B to Appendix J. An extended test interval for Type B tests may be increased to a specific value in a range of frequencies from greater than once per 30 months up to a maximum of once per 120 months. The specific test interval for Type B penetrations should be determined by a licensee in accordance with Section 11.0.

10.2.1.3 Repairs or Adjustments (Except Containment Airlocks)

In addition to the periodic as–found Type B test, an as–found Type B test shall be performed prior to any maintenance, repair, modification, or adjustment activity if the activity could affect the penetration's leak tightness. An as–left Type B test shall be performed following maintenance, repair, modification or adjustment activity. In addition, if a primary containment penetration is opened following as–found testing, a Type B test shall be performed prior to the time primary containment integrity is required. If the as–found and as–left Type B test results are both less than a component's allowable Administrative Limit, a change in test frequency is not required. If as–found or as–left test results are greater than the allowable administrative limit, provisions of Section 10.2.1.4 apply.

Frequency for a Type B testing shall be in accordance with Section 10.2.1.1 if the penetration is replaced or engineering judgment determines that modification of the penetration has invalidated the performance history. Testing shall continue at this frequency until adequate performance is established in accordance with Section 10.2.1.2.

10.2.1.4 Corrective Action

If Type B test results are not acceptable, then the testing frequency should be set at the initial test interval per Section 10.2.1.1. In addition, a cause determination should be performed and corrective actions identified that focus on those activities that can eliminate the identified cause of failure[1] with appropriate steps to eliminate recurrence. Cause determination and corrective action should reinforce achieving acceptable performance. Once the cause determination and corrective actions have been completed, acceptable performance may be reestablished and the testing frequency returned to the extended interval in accordance with Section 10.2.1.2.

Failures of Type B penetrations discovered during performance of a Type A test should be considered as failures of a Type B test for purposes of cause determination and corrective action. This includes failures of penetrations that were not previously identified by a Type B testing program.

10.2.2 Containment Airlocks

10.2.2.1 Test Interval

Containment airlock(s) shall be tested at an internal pressure of not less than P_a prior to a preoperational Type A test. Subsequent periodic tests shall be performed at a frequency of at least once per 30 months. Containment airlock tests should be performed in accordance with ANSI/ANS-56.8–2002. In addition, equalizing valves, door seals, and penetrations with resilient seals (i.e., shaft seals, electrical penetrations, view port seals and other similar penetrations) that are testable, shall be tested at a frequency of once per 30 months.

Airlock door seals should be tested prior to a preoperational Type A test. When containment integrity is required, airlock door seals should be tested within 7 days after each containment access.

For periods of multiple containment entries where the airlock doors are routinely used for access more frequently than once every 7 days (e.g., shift or daily inspection tours of the containment), door seals may be tested once per 30 days during this time period.

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[1] A failure in this context is exceeding an administrative limit and not the total failure of the penetration. Administrative limits are established at a value low enough to identify and allow early correction of potential total penetration failures.

Door seals are not required to be tested when containment integrity is not required, however they must be tested prior to reestablishing containment integrity. Door seals shall be tested at P_a, or at a pressure stated in the plant Technical Specifications.

10.2.2.2 Repairs or Adjustments of Airlocks

Following maintenance on an airlock pressure-retaining boundary, one of the following tests shall be completed:

- Airlock shall be tested at a pressure of not less than P_a; or
- Leakage rate testing at P_a shall be performed on the affected area or component.

10.2.2.3 Corrective Action

If containment airlock Type B test results are not acceptable, then a cause determination should be performed and corrective actions identified that focus on those activities that can eliminate the identified cause of a failure[2] with appropriate steps to eliminate recurrence. Cause determination and corrective action should reinforce achieving acceptable performance.

10.2.3 Type C Test Interval

10.2.3.1 Initial Test Interval

Type C tests shall be performed prior to initial reactor operation. Subsequent periodic Type C tests shall be performed at a frequency of at least once per 30 months, until adequate performance has been established consistent with Section 10.2.3.2.

10.2.3.2 Extended Test Interval

Test intervals for Type C valves may be increased based upon completion of two consecutive periodic as–found Type C tests where the result of each test is within a licensee's allowable administrative limits. Elapsed time between the first and last tests in a series of consecutive passing tests used to determine performance shall be 24 months or the nominal test interval (e.g., refueling cycle) for the valve prior to implementing Option B to Appendix J. Intervals for Type C testing may be increased to a specific value in a range of frequencies from 30 months up to a

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[2] A failure in this context is exceeding performance criteria for the airlock, not a total failure.

maximum of 75 months. Test intervals for Type C valves should be determined by a licensee in accordance with Section 11.0.

10.2.3.3 Repairs or Adjustments

In addition to the periodic as–found Type C test, an as–found Type C test shall be performed prior to any maintenance, repair, modification, or adjustment activity if it could affect a valve's leak tightness. An as–left Type C test shall be performed following maintenance, repair, modification or adjustment activity unless an alternate testing method or analysis is used to provide reasonable assurance that such work does not affect a valve's leak tightness and a valve will still perform its intended function.

If as–found and as–left Type C test results are both less than a valve's allowable administrative limit, a change of the test frequency is not required. If as–found or as–left test results are greater than the allowable administrative limit, then provisions of Section 10.2.3.4 apply.

The frequency for Type C testing shall be in accordance with Section 10.2.3.1 if a valve is replaced or engineering judgment determines that modification of a valve has invalidated the valve's performance history. Testing shall continue at this frequency until an adequate performance history is established in accordance with Section 10.2.3.2.

10.2.3.4 Corrective Action

If Type C test results are not acceptable, then the testing frequency should be set at the initial test interval per Section 10.2.3.1. In addition, a cause determination should be performed and corrective actions identified that focus on those activities that can eliminate the identified cause of a failure[3] with appropriate steps to eliminate recurrence. Cause determination and corrective action should reinforce achieving acceptable performance. Once the cause determination and corrective actions have been completed, acceptable performance may be reestablished and the testing frequency returned to the extended interval in accordance with Section 10.2.3.2.

Failures of Type C valves that are discovered during performance of a Type A test should be considered as a failure of a Type C test for purposes of cause determination and corrective action. This includes failures of valves that were not previously identified by a Type C test.

[3] A failure in this context is exceeding an administrative limit and not the total failure of the valve. Administrative limits are established at a value low enough to identify and allow early correction of total valve failures.

11.0 BASES FOR PERFORMANCE AND RISK–BASED TESTING FREQUENCIES FOR TYPE A, TYPE B, AND TYPE C TESTS

11.1 Introduction

This section provides guidance on establishing leakage testing frequencies and provides information regarding the risk impact of extending leakage rate testing intervals. Extended test intervals in Sections 9.0 and 10.0 have been selected based on performance, and have been assessed for risk impact. The various factors and discussion in this section should be considered when establishing different plant–specific testing frequencies.

Section 9.0 provides guidance on extending Type A ILRT surveillance intervals.

Section 10.0 presents a range of acceptable extended test intervals for Type B and Type C tests. Individual licensees may adopt specific testing intervals of up to 75 months as discussed in Section 10.0 without additional detailed analysis provided the performance factors discussed in Section 11.3.1 are considered. Additional programmatic controls are discussed in Section 11.3.2 and shall be considered when the extended test intervals are greater than 60 months.

11.2 Discussion

Assessments of the risk impact of extending leakage rate testing intervals have been performed at two different times to support similar objectives. The more recent risk impact assessment, completed in 2008, supported optimized ILRT interval extensions of up to fifteen years. The previous assessments completed in 1994-1995 supported Type A ILRT extensions of up to ten years, as well as extensions of Type B and Type C testing intervals.

The objective of the work concluded in 2008 and published as EPRI Product No. 1018243 “Risk Impact Assessment of Extended Integrated Leak Rate Testing Intervals” was to perform a general risk impact assessment for optimized ILRT intervals of up to fifteen years, utilizing current industry performance data and risk-informed guidance, primarily NRC Regulatory Guide 1.174, Revision 1. This risk impact assessment complements the previous EPRI report, TR-104285, *Risk Impact Assessment of Revised Containment Leak Rate Testing Intervals*. The earlier report considered changes to local leak rate testing intervals as well as changes to ILRT testing intervals. The original risk impact assessment considered the change in risk based on population dose, whereas the revision considered dose as well as large early release frequency (LERF) and containment conditional failure probability (CCFP). The following paragraphs discuss the approach taken and results of this assessment.

Approach

The first step was to obtain current containment leak rate testing and performance information. This was obtained through an NEI industry-wide survey conducted in 2001. Additional information regarding recent industry ILRT performance was obtained in 2007. A database was generated using this information supplemented with recent industry failure reports and previous survey information. The data indicate that there were no failures that could result in a risk-significant large early release. This information was used to develop the probability of a pre-existing leak in the containment.

The risk impact for two example plants, a PWR and BWR, was determined using conservative assumptions with accident classes developed similar to the original EPRI report but with enhancements for assessing changes in LERF.

Results

Using the conservative assumptions concerning the leakage and timing associated with a large early release, the reduction in frequency of the Type A ILRT test results in a change in LERF that ranges between the "very small" (< 1E-07) and "small" (1E-07 to 1E-06) risk increase regions of Regulatory Guide 1.174, Revision 1. In the cases where the risk increase is conservatively calculated to be greater than the "very small" region, the total LERF is significantly lower than the Regulatory Guide 1.174, Revision 1 threshold criteria of total LERF less than 1E-05 per year. The core damage frequency remains unchanged.

Other figures-of-merit have similar very small changes, including the population dose rate and the conditional containment failure probability (CCFP) changing very little over the range of ILRT interval extensions from 3 in 10 years to 1 in 15 years.

As can be seen from the two examples as well as the many plant-specific analyses developed to date to support one-time ILRT interval extensions, these results, and therefore the conclusions derived from them, are in general applicable. However, as required in Sections 9.2.3.1 and 9.2.3.3 of this guideline, plant-specific confirmatory risk impact assessments are also required.

Defense-in-depth as well as safety margins are maintained through the continued inspection of containment as required by ASME Section XI, Subsections IWE and IWL, and other required inspections, such as those performed to satisfy the Maintenance Rule. In addition, this guideline requires acceptable historical performance of Type A Integrated Leak Rate Tests before integrated leak rate testing intervals can be extended.

This risk impact assessment confirms previous (NUREG-1493) conclusions regarding risk in extending ILRT intervals up to fifteen years, using current regulatory guidance and risk-informed concepts.

Similar approaches were taken in 1994-1995, although the guidance of Regulatory Guide 1.174 was not available at that time. The following paragraphs discuss these approaches.

The effect of extending containment leakage rate testing intervals is a corresponding increase in the time that an excessive leak path would exist undiscovered and uncorrected. The degree to which intervals can be extended is a direct function of the potential effects on the health and safety of the public that occur due to an increased likelihood of undiscovered containment leakage.

In order to determine the acceptability of extended testing intervals, the methodology described in NUREG–1493 was applied, with some modifications, to historical representative industry leakage rate testing data gathered from approximately 1987 to 1993, under the auspices of NEI. The range of testing intervals recommended for Type B and Type C testing was evaluated to determine the level of increased risk in the event of an accident. The same methodology was also applied to the 10–year interval for Type A testing. In all cases, the increased risk corresponding to the extended test interval was found to be small and compares well to the guidance of the NRC's safety goals.

NUREG–1493 provided the technical basis to support rulemaking to revise leakage rate testing requirements contained in Option B to Appendix J. The basis consisted of qualitative and quantitative assessments of the risk impact (in terms of increased public dose) associated with a range of extended leakage rate testing intervals.

NUREG–1493 found the effect of Type B and Type C testing on overall accident risk is small and concluded that:

- Performance–based alternatives to local leakage rate testing requirements are feasible without significant risk impacts; and

- Although extended testing intervals led to minor increases in potential off–site dose consequences, the actual decrease in on–site (worker) doses exceeded (by at least an order of magnitude) the potential off–site dose increases.

NEI, in conjunction with EPRI, undertook a similar study in order to supplement NRC's rulemaking basis and provide added assurance the more detailed elements in this guideline have an adequate basis. Results of the EPRI study are documented in EPRI Research Project Report TR–104285, "Risk Impact Assessment of Revised Containment Leak Rate Testing Intervals."

EPRI developed an abbreviated methodology that was used to assess plant risk impact associated with containment leakage rate testing alternatives currently being proposed by this guideline. The overall approach involved an examination of the risk spectra from accidents reported in PWR and BWR IPEs. Plant risk was quantified for PWR and BWR representative plants. Quantification of the risk considered the consequences from containment leakage in more detail than reported in IPEs. The impact associated with alternative Type B and Type C test intervals, measured as a change in risk contribution to baseline risk, is presented in Table 1. The risk values compare well with the analysis in NUREG–1493.

The risk model was specifically quantified by using a "failure to seal" probability (as opposed to failure to close considered in IPEs). This required failure rates to be developed for this failure mode. Type B and Type C test data obtained by NEI allowed determination of failure rates where failure is defined as the measured leakage exceeding allowable administrative limits for a specific Type B or Type C component. The failure rate values were used in the containment isolation system fault tree, and used to calculate a failure–to–seal probability. Characterization of baseline risk (in terms of accident sequences that are influenced by containment isolation valve or containment penetration leakage rate) allowed the plant models to calculate the risk impact associated with changes in test intervals.

As indicated above, historical industry failure rate data was used to develop the component failure to seal probabilities used in the analysis. This approach is quite conservative because these guidelines require demonstration of performance prior to extending the component leakage rate testing interval. The performance demonstration consists of successful completion of two consecutive leakage rate tests to increase the interval from 30 to 60 months and three consecutive leakage rate tests to increase the interval to greater than 60 months. This takes advantage of the findings of NUREG–1493, Appendix A, which suggests that "If the component does not fail within two operating cycles, further failures appear to be governed by the random failure rate of the component," and "Any test scheme considered should require a failed component pass at least two consecutive tests before allowing an extended test interval." In addition, the penetration failure analysis considered components that exceeded the administrative limits as failures. The containment leakage rate computation conservatively used maximum pathway leak rates derived from the upper bounds of the NEI data. Therefore, the analysis is very conservative, and the component performance trending provides the necessary confidence demonstration that component leakage is being managed at a low level.

For Type C test, a bounding analysis was performed that assumed all valves have test intervals that were extended to 48, 60, 72 and 120 months. For Type B tests, it was assumed that electrical penetrations were tested at a nominal 120 months frequency. In addition, it was assumed that some portion of the penetrations was tested periodically during the 120 months. Airlock tests were assumed to be conducted every 24 months. Blind flanges were assumed to be tested after each opening, or at 48–month intervals.

There are many points of similarity between the NUREG–1493 report and the EPRI study, both in methodology and assumptions, reflecting close agreement on elements important to safety for containment leakage rate testing. The similarity also extends to the results. The EPRI study confirms the low risk significance associated with Type A testing intervals of 10 years. Similarly, extending the Type B and Type C test intervals to 120 months was found acceptable provided the Type B or Type C components have successfully passed two consecutive tests, and provided that certain controls were imposed on the leakage rate testing program.

Changing Appendix J test intervals from those presently allowed to those in this guideline slightly increases the risk associated with Type A and Type B and Type C–specific accident sequences as discussed in Table 1. The data suggests that increasing the Type C test interval can slightly increase the associated risk, but this ignores the risk reduction benefits associated with increased test intervals. In addition, when considering the total integrated risk (representing all accident sequences analyzed in the IPE), the risk impact associated with increasing test intervals is negligible (less than 0.1 percent of total risk). This finding is further reinforced by the conservative assumptions used in the analysis. The EPRI study reaffirms the conclusion in NUREG–1493 that changes to leakage testing frequencies are "feasible without significant risk impact."

Table 1

Risk Results for Type A, Type B, and Type C Test Intervals

Test Type	***Risk–Impact Current Test Intervals***	***Risk–Impact Extended Test Intervals***	***Comment***
	PWR Representative Plant Summary		
Type A	The increase in ILRT test intervals from 3 in 10 years to 1 in15 years results in a small change in LERF that ranges between the "very small" (<1E-07) and "small" (1E-07 to 1E-06) ΔLERF risk increase regions of NRC Regulatory Guide 1.174. In cases where the risk increase is greater than the "very small" region, the total LERF is significantly lower than the Regulatory Guide 1.174 threshold criteria of total LERF < 1E-05 per year. Changes in population dose and CCFP are also very small.		Please refer to EPRI Report 1018243, PWR example discussion for more information.
Type B	«0.001% incremental risk contribution 6.9E–05 person–rem/yr rebaselined risk	<0.001% incremental risk contribution, 1.3E–04 person–rem/yr rebaselined risk. Based on testing with some components tested periodically during time interval months. In addition, blind flanges and penetrations would be removed and retested during every refueling outage. Airlocks to be tested every 24 months.	A range of 0.2 to 4.4 percent is provided for other plants for both Type B and Type C penetrations in NUREG–1493.
Type C	0.022% of total risk 4.9E–03 person–rem/yr	0.04% incremental risk contribution, 8.8E–03 person–rem/yr rebaselined risk, based on 48 month test intervals. 1E–2, 1.2E–2, and 1.64E–2 person–rem/yr risk, based on 60, 72, and 120 month test intervals	A range of 0.2 to 4.4 percent of total risk is provided for other plants for both Type B and Type C penetrations in NUREG–1493.

Table 1 (continued)

BWR Representative Plant Summary			
Type A	The increase in ILRT test interval from 3 in 10 years to 1 in15 years results in a change in LERF that falls in the "very small" (<1E-07) ΔLERF risk increase region of NRC Regulatory Guide 1.174. Moreover, the total LERF is significantly lower than the Regulatory Guide 1.174 threshold criteria of total LERF < 1E-05 per year. Changes in population dose and CCFP are also very small.		Please refer to EPRI Report 1018243, BWR example discussion for more information.
Type B	<0.001% of total risk 8.0E–06 person–rem/yr	0.001%, 1.85E–05 person–rem/yr Based on testing with some components tested periodically during time interval months. In addition, blind flanges and penetrations would be removed and retested during every refueling outage. Airlocks to be tested every 24 months.	A range of 0.2 to 4.4 percent is provided for other plants for both B and C penetration types in NUREG–1493.
Type C	0.002% of total risk 4.5E–06 person–rem/yr	0.006% of total risk, 1.1E–04 person–rem/yr, based on 48 months test intervals. 1.8E–4, 2.3E–4, and 5.01E–4 person–rem/yr risk, based on 60, 72, and 120 month test intervals.	A range of 0.2 to 4.4 percent is provided for other plants for both B and C penetration types in NUREG–1493.

11.3 Plant–Specific Testing Program Factors

A licensee may adopt specific surveillance frequencies from Section 10.0 provided that plant–specific test performance history is acceptable as discussed in Section 10.0, and certain performance factors and controls are reviewed and applied as appropriate in the determination of test intervals. Each licensee should demonstrate by quantitative or qualitative review that plant–specific performance is adequate to support the extended test interval.

11.3.1 Performance Factors

Prior to determining and implementing extended test intervals for Type B and Type C components, an assessment of the plant's containment penetration and valve performance should be performed and documented. The following are some factors that have been identified as important and should be considered in establishing testing intervals:

- *Past Component Performance* — Based on a survey sample of industry data from approximately 1987 to 1993, 97.5% of the industry's containment penetrations have not failed a Type B test, and 90% of the isolation valves have never failed a Type C test in over 500 reactor–years of commercial operation. Of the 10% of the Type C tests that have failed, only 22% of those have failed more than once. A licensee should ensure that leakage rate testing intervals are not extended until plant–specific component performance of two successful consecutive as–found tests are performed.

- *Service* — The environment and use of components are important in determining its likelihood of failure. For example, a plant may have experienced high leakage in valves in a high–flow steam environment due to effects of valve seat erosion. Certain valves that open and close frequently during normal plant operations may have experienced higher leakage. Moreover, penetrations and valves may have components that are sensitive to age-related degradation, including resilient seals subject to high-temperature conditions, certain electrical penetrations with epoxy seals, and mechanical bellows. The licensee's testing program should identify these types of components to establish their testing intervals based on their performance history.

- *Design* — Valve type and penetration design may contribute to leakage. For example, motor operated valves in a plant may be found to leak less frequently than check valves, and may support a longer test interval. Vendor recommendations for valve or penetration subcomponent service life may be a factor in determining test intervals. Certain passive penetrations, such as electrical penetrations, may have had excellent performance history. Test intervals for these penetrations may be relatively longer.

- *Safety Impact* — The relative importance of penetrations can be judged in terms of the potential impact of failure in limiting releases from containment under accident conditions. Due to size or system inter–connections, some components or penetrations may be more important than others in ensuring the safety function of a containment penetration is achieved. This relative importance should be considered in determining the test interval.

- *Cause Determination* — For failures identified during an extended test interval, a cause determination should be conducted and appropriate corrective actions identified. Part of a corrective action process should be to identify and address common–mode failure mechanisms.

11.3.2 Programmatic Controls

If a licensee considers extended test intervals of greater than 60 months for a Type B or a Type C tested component, the review to establish surveillance test intervals should include the additional considerations:

- *As–found Tests* — In order to provide additional assurance that the increased probability of component leakage is kept to a minimum, and is reasonably within the envelope of industry data, a licensee should consider requiring three successive periodic as–found tests to determine adequate performance.

- *Schedule* — To minimize any adverse effects of unanticipated random failures, and to increase the likelihood unexpected common–mode failure mechanisms will be identified in a timely manner, a licensee should implement a testing program that ensures components are tested at approximate evenly– distributed intervals across the extended testing interval for valves or groups of valves. A licensee should schedule a portion of the tests during each regularly scheduled outage or on some regular periodic basis, such that some percentage of the components are tested periodically, and all components are tested at the new extended test interval of greater than 60 months.

- *Review* — A review of the entire process should be performed prior to establishing alternate test intervals under 10CFR50, Appendix J, Option B, including plant–specific performance history, data analysis, establishment of surveillance frequencies, and, if available and applicable, any risk–impact assessment. This review should include adjustments to the program as required, based on expert insight or engineering judgment. Results of the review should be documented.

Type B and C leakage - When routinely scheduling any LLRT interval beyond 60-months, the primary containment leakage rate testing program trending or monitoring (Section 12.1) shall include an estimate of the amount of understatement in the minimum pathway Type B & C summation. The estimate must be included in the post-outage report of Section 12.1 and include the reasoning and determination of the acceptability of the extension, demonstrating that the LLRT totals calculated represent the actual leakage potential of the penetrations.

- *Note* – Refer to NRC SER for NEI 94-01, Revision 3, Dated June 8, 2012 for additional information regarding understatement in the minimum pathway Type B & C summation.

12.0 RECORDKEEPING

12.1 Report Requirements

A post–outage report shall be prepared presenting results of the previous cycle's Type B and Type C tests, and Type A, Type B, and Type C tests, if performed during that outage. The technical contents of the report are generally described in ANSI/ANS-56.8–2002, and shall be available on–site for NRC review. The report shall show that the applicable performance criteria are met, and serve as a record that continuing performance is acceptable. The report shall also include the combined Type B and Type C leakage summation, and the margin between the Type B and Type C leakage rate summation and its regulatory limit. Adverse trends in the Type B and Type C leakage rate summation shall be identified in the report and a corrective action plan developed to restore the margin to an acceptable level.

12.2 Records

Documentation developed for implementation of 10CFR50, Appendix J, Option B should be performed in accordance with licensee established procedures. Sufficient documentation shall be collected and retained so that the effectiveness of the implementation of 10CFR50, Appendix J, Option B can be reviewed and determined. This documentation, including the plant-specific confirmatory risk impact assessment for extending ILRT intervals beyond ten years shall be available for internal and external review, but is not required to be submitted to the NRC.

APPENDIX A
REGULATORY CORRESPONDENCE
RELEVANT TO NEI 94-01 R3

CONTENTS

The contents of this appendix are as follows:

- NRC Request for additional information re: NEI Topical Report 94-01, Revision 2-A, Supplement 1 dated December 3, 2009
- NEI Response to 12/3/2009 NRC RAI dated March 29, 2011
    - Although this response refers to EPRI Product 1022599, "Type C Containment Isolation Valve Performance", this report is not included and may be obtained from EPRI.
- NRC Letter dated April 21, 2011, re: Revision 3 to NEI NUMARC 94-01
- NEI Response to NRC 4/21/2011 letter, dated June 9, 2011

NRC Request for additional information re: NEI Topical Report 94-01, Revision 2-A, Supplement 1 dated December 3, 2009

December 3, 2009

Mr. James H. Riley, Director
Engineering
Nuclear Energy Institute
Suite 400
1776 I Street, NW
Washington, DC 20006-3708

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION RE: NUCLEAR ENERGY INSTITUTE TOPICAL REPORT 94-01, REVISION 2-A SUPPLEMENT 1, "INDUSTRY GUIDELINE FOR IMPLEMENTING THE PERFORMANCE-BASED OPTION OF 10 CFR PART 50, APPENDIX J" (TAC NO. ME2164)

Dear Mr. Riley:

By letter dated September 2, 2009, the Nuclear Energy Institute (NEI) submitted for U.S. Nuclear Regulatory Commission (NRC) staff review Topical Report (TR) 94-01, Revision 2-A Supplement 1, "Industry Guideline For Implementing The Performance-Based Option Of 10 CFR Part 50, Appendix J." Upon review of the information provided, the NRC staff has determined that additional information is needed to complete the review. On November 24, 2009, Julie Keys, Senior Project Manager, and I agreed that the NRC staff will receive your response to the enclosed Request for Additional Information (RAI) questions by January 29, 2009. If you have any questions regarding the enclosed RAI questions, please contact me at 301-415-3610.

Sincerely,

/RA/

Tanya M. Mensah, Senior Project Manager
Special Projects Branch
Division of Policy and Rulemaking
Office of Nuclear Reactor Regulation

Project No. 689

Enclosure: RAI questions

cc w/encl: See next page

NRC RAI Dated 12/3/2009

REQUEST FOR ADDITIONAL INFORMATION

BY THE OFFICE OF NUCLEAR REACTOR REGULATION

TOPICAL REPORT 94-01, REVISION 2-A SUPPLEMENT 1, "INDUSTRY GUIDELINE FOR IMPLEMENTING THE PERFORMANCE-BASED OPTION OF 10 CFR PART 50, APPENDIX J"

NUCLEAR ENERGY INSTITUTE

PROJECT NO. 689

By letter dated September 2, 2009, the Nuclear Energy Institute (NEI) submitted for U.S. Nuclear Regulatory Commission (NRC) staff review Topical Report (TR) 94-01, Revision 2-A Supplement 1, "Industry Guideline For Implementing The Performance-Based Option Of 10 CFR Part 50, Appendix J." Based on the review of TR 94-01, Revision 2-A Supplement 1, the NRC staff is requesting additional information, as described below, to complete the review.

In the letter dated September 2, 2009, the NEI identified a concern with the grace period for testing the Type C components as described in NEI TR 94-01, Revision 2-A. In this letter, the NEI requested that the NRC staff approve a return to the original wording contained in the previous version of NEI TR 94-01.

This request in itself is administratively acceptable to the NRC staff. However, based on several conference calls held with the NEI, the NRC staff has noted a difference in understanding between the NEI and NRC staff as to the intent and use of the grace period contained in the original wording. The NRC staff's position in this regard is contained in the following documents, excerpts of which are quoted below:

- Regulatory Position C.1 in Regulatory Guide 1.163 "Performance-Based Contained Leak-Test Program:

  "Section 11.3.2, "Programmatic Controls," of NEI 94-01 provides guidance for licensee selection of an extended interval greater than 60 months or 3 refueling cycles for a Type B or Type C tested component. Because of uncertainties (particularly unquantified leakage rates for test failures, repetitive/common mode failures, and aging effects) in historical Type C component performance data, and because of the indeterminate time period of three refueling cycles and insufficient precision of programmatic controls described in Section 11.3.2 to address these uncertainties, the guidance provided in Section 11.3.2 for selecting extended test intervals greater than 60 months for Type C tested components is not presently endorsed by the Nuclear Regulatory Commission (NRC) staff. Further, the interval for Type C tests for main steam and feedwater isolation valves in Boiling Water Reactors (BWR), and containment purge and vent valves in Pressurized Water Reactor (PWR) and BWRs, should be limited to 30 months as specified in Section 3.3.4 of ANSI/ANS-56.8-1994, with consideration given to operating experience and safety significance."

- Final rule published in the "Federal Register/Vol. 60, No. 186/Tuesday, September 26, 1995/Rules and Regulations" (60FR49495) regarding the risk-informed regulation based on the performance history of components (containment, penetrations, valves) as a means to justify an increase in the interval for Type A, B, and C tests:

  "Type B & Type C Test Interval (1) Allow local leakage-rate test (LLRTs) intervals to be established based on the performance history of each component; (2) the performance criterion for the tests will continue to be the allowable leakage rate (La); (3) Specific performance factors for establishing extended test intervals (up to 10 years for Type B components, and 5 years for Type C components) are contained in the regulatory guide and industry guideline. In the regulatory guide, the NRC has taken exception to the NEI guideline allowing the extension of Type C test intervals up to 10 years, and limits such extension to 5 years."

  "In establishing the 5-year test interval for LLRTs, the NRC has designed a cautious, evolutionary approach as data are compiled to minimize the uncertainty now believed to exist with respect to LLRT data. The NRC's judgment, based on risk assessment and deterministic analysis, continues to be that the limited data base on unquantified leakages and common mode repetitive failures introduces significant uncertainties into the probabilistic risk analysis. The NRC will be open to submittals from licensees as more performance-based data are developed. The extension of LLRT test interval to 5 years is a prudent first step. By allowing a 25 percent margin in testing frequency requirements, the NRC has provided the flexibility to accommodate longer fuel cycles."

Based on the above, the NRC staff's view is that tests are not supposed to be scheduled automatically using the interval plus grace period to routinely stretch the interval to the next refueling outage after the sixty months (5 years) allowed interval. The NEI appears to be interpreting that the grace period is a permanent interval extension to allow plants on a 24-month cycle to test every third refuel outage. The NRC staff disagrees with this interpretation. As stated clearly in the *Federal Register*, the NRC is open to submittals from licensees as more performance-based data is available.

In the letter dated September 2, 2009, the NEI provided performance-based data which the NRC staff believes is inadequate to conclude that Type C component performance has improved or sustained. This letter states that based on past NEI and Appendix J Owners Group surveys, the penetration leakages did not result in violation of combined penetration leakage limit of $0.6L_a$. The NRC staff disagrees in that being within the leakage limit of $0.6L_a$ does not necessarily indicate that Type C leakage performance of the valves has improved or maintained, when compared to their performance before and during the early stages of Option B implementation.

- Please submit such data coupled with a technical basis to justify your request.
- Also, provide a discussion on the net benefits to the industry based on risk impact and reduced testing.

NEI Response to NRC RAI 12/3/2009

NUCLEAR ENERGY INSTITUTE

Biff Bradley
DIRECTOR
RISK ASSESSMENT
NUCLEAR GENERATION DIVISION

March 29, 2011

Mr. Sheldon D. Stuchell
Sr. Project Manager
Division of Policy & Rulemaking
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

Subject: Information to Support Proposed Revision 3 to NUMARC 91-04, *Industry Guideline for Implementing Performance-Based Option of 10 CFR Part 50, Appendix J*

Project Number: 689

Dear Mr. Stuchell:

Please find the following information in support of our request for NRC approval of Revision 3 to NUMARC 91-04.

> Attachment 1 responds to a December 3, 2009, NRC request for additional information (RAI). In addition, in response to an NRC email of September 30, 2010, documenting a conference call of September 29, 2010, this document also includes references to RG-1.163, DG-1220, and the Standard Technical Specifications as applicable to the local leak rate testing (LLRT) "grace period" for extension of Type C testing intervals. Responses made to comments made during a conference call conducted on December 15, 2010, are also included.
>
> Attachment 2 provides an interim report on a project initiated by EPRI to collect and analyze recent (since 1996) Type C local leak rate testing (LLRT) performance data. The data and analysis is intended to enable identification of good practices, support improved performance, and to reduce the uncertainty in Type C LLRT data referred to in NRC documents. This interim report provides information on the leak-tight performance of Type C containment isolation valves tested on extended intervals in accordance with NEI 94-01 for the period of 1996 to 2010.

NEI Response to NRC RAI 12/3/2009

Attachment 3 provides a proposed revision 3 to NUMARC 91-04, *Industry Guideline for Implementing Performance-Based Option of 10 CFR Part 50, Appendix J.* Attachment 3 is a line-in, line-out version. This revision restores the 75-month interval for Type C testing, and extends considerations for extended interval use to include Type C testing.

We believe we have been responsive to NRC requests to document the basis for restoring the 75-month Type C test interval, and we request NRC approval of the attached revision 3 to NUMARC 94-01. If you have any questions or require additional information, please contact me at 202.739.8083, reb@nei.org.

Sincerely,

Biff Bradley

Attachments

ATTACHMENT 1

Responses to NRC Requests for Information on
Type C Containment Isolation Valve
Leak-tight Performance
March 28, 2011

This document addresses the December 3, 2009 NRC request for additional information (RAI). In addition, in response to an NRC email of September 30, 2010 documenting a conference call of September 29, 2010, this document also includes references to RG-1.163, DG-1220, and the Standard Technical Specifications as applicable to the local leak rate testing (LLRT) "grace period" for extension of Type C testing intervals. Responses made to comments made during a conference call conducted on December 15, 2010 are also included.

Attached to this document are (1) EPRI Report No. 1022599, "Type C Containment Isolation Valve Performance", January 2011 and (2) NEI 94-01, Revision 3 (a mark-up copy of NEI 94-01 R2A).

Request for Additional Information (RAI)

The December 2009 RAI concludes with the following paragraphs:

> "Based on the above, the NRC staff's view is that tests are not supposed to be scheduled automatically using the interval plus grace period to routinely stretch the interval to the next refueling outage after the sixty months (5 years) allowed interval. The NEI appears to be interpreting that the grace period is a permanent interval extension to allow plants on a 24-month cycle to test every third refuel outage. The NRC staff disagrees with this interpretation. As stated clearly in the *Federal Register*, the NRC is open to submittals from licensees as more performance-based data is available.
>
> In the letter dated September 2, 2009, the NEI provided performance-based data which the NRC staff believes is inadequate to conclude that Type C component performance has improved or sustained. This letter states that based on past NEI and Appendix J Owners Group surveys, the penetration leakages did not result in violation of combined penetration leakage limit of 0.6La. The NRC staff disagrees in that being within the leakage limit of 0.6La does not necessarily indicate that Type C leakage performance of the valves has improved or maintained, when compared to their performance before and during the early stages of Option B implementation.
>
> - Please submit such data coupled with a technical basis to justify your request.
> - Also, provide a discussion on the net benefits to the industry based on risk impact and reduced testing."

RAI Response:

Introduction and Summary

The basic issue that is being addressed in the RAI and in this response is the 15-month allowable extension contained in Section 10.1 of NEI 94-01 for scheduling LLRTs of Type C containment isolation valves on extended intervals. The Final Rule[1] for 10 CFR Part 50, Appendix J, Option B (1995) allowed a 25% (15-month "grace period") margin in testing frequency requirements for intervals of 60 months. As stated above in the RAI, "...The NRC staff's view is that tests are not supposed to be scheduled automatically using the interval plus grace period to routinely stretch the interval to the next refueling outage after the sixty month (5 years) allowed interval". This position was incorporated in Revision 2A of NEI 94-01 (Nov. 2008). Industry objected to it because it limited extended testing intervals for plants on two-year fuel cycles to less than 60 months (two fuel cycles) instead of the previously used 75 (60+15) month extended intervals associated with three fuel cycle outages. Moreover, the aforementioned Final Rule also states:

> "In establishing the 5-year test interval for LLRTs, the NRC has designed a cautious, evolutionary approach as data are compiled to minimize the uncertainty now believed to exist with respect to LLRT data. The NRC's judgment, based on risk assessment and deterministic analysis, continues to be that the limited database on unquantified leakages and common mode and repetitive failures introduces significant uncertainties into the probabilistic risk analysis. The NRC will be open to submittals from licensees as more performance-based data are developed."

In order to reduce the uncertainty and thereby allow for increasing the allowable extended interval, LLRT leaktight performance data was obtained from industry which validated the risk impact assessment of EPRI TR-104285, "Risk Impact Assessment of Revised Containment Leak Rate Testing Intervals", August 1994. It is believed that this validated assessment justifies increasing allowable extended LLRT intervals to the 120 months specified in NEI 94-01, Revision 0. It is requested that the allowable extended interval for Type C LLRTs be increased only to 75 months, to be conservative (also as a "cautious evolutionary approach), with a permissible extension (for non-routine emergent conditions) of nine months (84 months total). Increasing the allowable extended interval to 75 months will obviate any need for plants on 24-month fuel cycles to routinely employ a permissible extension period. A marked-up copy of NEI 94-01R2A with changes to the allowable extended interval from 60 months to 75 months is attached. It is intended that this guideline be reissued as NEI 94-01Revision 3 upon approval of this request. Consideration may be given to increasing the allowable extended interval to 120 months in the future.

[1] Federal Register September 26, 1995, Volume 60, No. 186, Page 49502

Data

Data collected in 2010 covering the period of 1996-2010 for leak-tight performance of Type C containment isolation valves on extended intervals is presented in EPRI report No. 1022599, "Type C Containment Isolation Valve Performance", January 2011 attachment (1) to this document. This report concludes that the leak-tight performance of Type C containment isolation valves tested on extended intervals after 1995 is significantly better than the leak-tight performance of the general population of Type C valves tested before 1995. These pre-1995 local leak rate tests were conducted prior to the implementation of Appendix J, Option B and NEI 94-01. The failure rate[2] for valves tested on extended intervals (after implementation of NEI 94-01 in 1995) was about an order of magnitude less than that reported in EPRI TR-104285 and in NUREG-1493 for the general population of valves tested before the 1995 time frame. Specifically, since 1995, 148 of the 2055 extended interval tested valves exhibited leakage above the plant-specified administrative limits ("failures"). Failure rates were determined for each of the 26 reporting units, and the average failure rate of all 2055 valves was determined to be 5.5E-3 failures/valve-year or 6.3E-7 failures/valve-hr. Performance of valves in two plants studied in NUREG-1493 before 1995 indicated failure rates of 5E-2/yr (5.7E-6/hr) and 8.6E-2/yr (9.8E-6/hr), respectively. Estimated failure rates of valves in the EPRI report were 8.8E-2/yr (1E-5/hr) for check, globe and butterfly valves.

Technical/Risk Basis

As referred to in NEI 94-01, EPRI TR-104285 provided a risk impact assessment of alternative testing intervals for both Integrated Leak Rate Tests (ILRT) and Local Leak Rate Tests (LLRT). Risk involved in conducting Type C LLRTs on extended intervals (using population dose as the metric) was determined using valve leakage performance data obtained from industry by the Nuclear Energy Institute (NEI). This pre-1995 data was very conservatively applied in the risk impact assessment by assuming that the leakage magnitude for a penetration would be that associated with the valve in the penetration that exceeded its administrative limit. As stated previously, the recent (post-1995) failure rate data indicates that the failure rate of Type C valves tested on extended intervals was significantly less than the failure rate for the general population of Type C valves tested pre-1995. The recent data also indicates that this conservative leakage magnitude is only appropriate for the 4.7% of valve failures involving redundant valves in penetrations. It is recognized that the valve-specific performance between these two data collection periods is really not comparable. However, the application of this recent data to the risk impact assessment of EPRI TR-104285 is very appropriate insofar as the underlying objective is to assess the risk involved with testing only those valves that qualify for testing on extended intervals in accordance with NEI 94-01. Therefore, this 1994 risk impact assessment remains conservative and valid.

[2] A failure is defined as a valve exceeding its administrative leakage limit as defined in Section 10.2 of NEI 94-01.

Following is a tabulation of risk impact due to Type C testing for various extended Type C testing intervals, from the EPRI risk impact assessment:

Table 4, Risk Impact of Type C LLRT Surveillance Intervals

Interval >	24 months – base interval	48 months - extended	60 months - extended	72 months - extended	75* months exten-ded	84* months exten-ded	120 months - extended
PWR Type C dose (1)	4.9E-3	8.8E-3	1.0E-2	1.2E-2	1.22 E-2	1.3E-2	1.6E-2
PWR Type C dose, % of Total (2)	0.0223%	0.04%	0.045%	0.0545%	0.0555%	0.0591%	0.0727%
PWR dose increase, % of total	0	0.0177	0.0227	0.0322	0.0332	0.0368	0.051
BWR Type C dose (1)	4.5E-5	1.1E-4	1.8E-4	2.3E-4	2.48E-4	2.82E-4	5.0E-4
BWR Type C dose, % of Total (2)	0.00231%	0.00564%	0.00923%	0.0118%	0.0127%	0.0145%	0.0256%
BWR dose increase, % of total	0	0.00333	0.00692	0.0097	0.00949	0.0122	0.0233

* Values interpolated from original report table

(1) Dose is quantified in units of person-rem/yr

(2) Total dose represents total integrated risk from all accidents, testing, etc. and is dominated by severe accident phenomena. Risk impact of testing is a small fraction of this. The total dose for representative plants was determined to be about 22 person-rem/year for PWRs and about 1.95 person-rem/year for BWRs.

Inspection of the table indicates that the risk impact associated with restoring (increasing) the nominal Type C extended testing interval grace from 60 months to 75 months with a permissible

extension to 84 months is extremely small, less than 0.014% of the total dose for PWRs and less than 0.0053% for BWRs.
It had been previously requested that the 15-month allowable extension period be reinstated. However, it is recognized that the routine use of permissible extension periods ("grace periods") is not supported by the NRC Staff. Insofar as a 120-month Type C LLRT interval is justified based on risk impact, it is recommended that the current 60-month allowable extended testing interval for Type C LLRTS be increased to 75 months with a permissible extension period of 9 months (total of 84 months) for non-routine emergent conditions.

<u>Benefits</u>
The benefits of increasing the allowable extended testing interval for Type C LLRTS by 15 months from 60 months to 75 months will result in is a reduction in the amount of testing required, with commensurate reductions in radiation exposure, personnel time in lining up for tests, draining systems, conducting tests, and the risk involved in performing such testing. As previously noted, this is of particular importance for plants on 24-month fuel cycles. Type C tests on extended intervals could then be performed every third refueling cycle, instead of every other fuel cycle as is presently required to not exceed the 60-month allowable extended interval.

Consideration of relevant sections of other documents:

Regulatory Guide 1.163

Regulatory Position 2:

Section 11.3.2, "Programmatic Controls," of NEI 94-01 provides guidance for licensee selection of an extended interval greater than 60 months or 3 refueling cycles for a Type B or Type C tested component. Because of uncertainties (particularly unquantified leakage rates for test failures, repetitive/common mode failures, and aging effects) in historical Type C component performance data, and because of the indeterminate time period of three refueling cycles and insufficient precision of programmatic controls described in Section 11.3.2 to address these uncertainties, the guidance provided in Section 11.3.2 for selecting extended test intervals greater than 60 months for Type C tested components is not presently endorsed by the NRC staff. Further, the interval for Type C tests for main steam and feedwater isolation valves in BWRs, and containment purge and vent valves in PWRs and BWRs, should be limited to 30 months as specified in Section 3.3.4 of ANSI/ANS-56.8-1994, with consideration given to operating experience and safety significance.

> Response: The 30-month limitation on leakage testing intervals for main steam and feedwater isolation valves and containment purge and vent valves has been incorporated in NEI 94-01R2A. Reinstatement of Type C LLRT nominal surveillance intervals to at least 75 months vs. the aforementioned 60 months is the objective of this response.

Draft Regulatory GuideDG-1220:

NEI TR 94-01, Revision 2-A, provides methods that the NRC staff considers acceptable for complying with the provisions of Option B in Appendix J to 10 CFR Part 50, subject to the limitations and conditions provided in Section 4.0 of the NRC FSER and the following regulatory positions:

> Response: Industry is not in agreement with the maximum extended interval of 60 months and the 9-month permissible extension change contained in Section 10.1 of NEI 94-01R2A.

Standard Technical Specifications:

Surveillance programs for Type C valve LLRTs are now contained in a licensee's Containment Leak Rate Testing Program, described in Section 5.5.16 of the Standard Technical Specifications.

Regarding extended intervals, the following apply:

SR 3.0.2

The specified Frequency for each SR is met if the Surveillance is performed within 1.25 times the interval specified in the Frequency, as measured from the previous performance or as measured from the time a specified condition of the Frequency is met.

For Frequencies specified as "once," the above interval extension does not apply.

If a Completion Time requires periodic performance on a "once per . . ." basis, the above Frequency extension applies to each performance after the initial performance.

Exceptions to this Specification are stated in the individual Specifications

SR 3.0.2 Bases

SR 3.0.2 establishes the requirements for meeting the specified Frequency for Surveillances and any Required Action with a Completion Time that requires the periodic performance of the Required Action on a "once per . . ." interval.

SR 3.0.2 permits a 25% extension of the interval specified in the Frequency. This extension facilitates Surveillance scheduling and considers plant operating conditions that may not be suitable for conducting the Surveillance (e.g., transient conditions or other ongoing Surveillance or maintenance activities). The 25% extension does not significantly degrade the reliability that results from performing the Surveillance at its specified Frequency.

This is based on the recognition that the most probable result of any particular Surveillance being performed is the verification of conformance with the SRs. The exceptions to SR 3.0.2 are those

Surveillances for which the 25% extension of the interval specified in the Frequency does not apply. These exceptions are stated in the individual Specifications. The requirements of regulations take precedence over the TS. An example of where SR 3.0.2 does not apply is in the Containment Leakage Rate Testing Program. This program establishes testing requirements and Frequencies in accordance with the requirements of regulations. The TS cannot in and of themselves extend a test interval specified in the regulations. As stated in SR 3.0.2, the 25% extension also does not apply to the initial portion of a periodic Completion Time that requires performance on a "once per ..." basis. The 25% extension applies to each performance after the initial performance. The initial performance of the Required Action, whether it is a particular Surveillance or some other remedial action, is considered a single action with a single Completion Time. One reason for not allowing the 25% extension to this Completion Time is that such an action usually verifies that no loss of function has occurred by checking the status of redundant or diverse components or accomplishes the function of the inoperable equipment in an alternative manner.

The provisions of SR 3.0.2 are not intended to be used repeatedly merely as an operational convenience to extend Surveillance intervals (other than those consistent with refueling intervals) or periodic Completion Time intervals beyond those specified.

> Response: When Regulatory Guide 1.163 was issued in 1995, NRC permitted extension of LLRT intervals of up to 15 months to accommodate plants on 24-month fuel cycles.
>
> The RAI states:
>
> "Based on the above, the NRC staff's view is that tests are not supposed to be scheduled automatically using the interval plus grace period to routinely stretch the interval to the next refueling outage after the sixty months (5 years) allowed interval. The NEI appears to be interpreting that the grace period is a permanent interval extension to allow plants on a 24-month cycle to test every third refuel outage. The NRC staff disagrees with this interpretation."

As implied from the above, the routine use of a 15-month extension is not supported by the NRC Staff. Therefore, a restoration of the allowable extension intervals for Type C LLRTs to 75 months together with an allowable extension period of 9 months is requested.

NEI Response to NRC RAI 12/3/2009 – Attachment 1

Responses to comments made during the December 15, 2010 conference call between NRC, NEI, and EPRI:

No.	NRC Question/Comment	Response	Comments
1	Does EPRI expect to change any of the information in its interim report?	Some changes were made to the report in response to item 5 below. The impact on the results was not significant. If more plant data is received, additional changes will be made	EPRI will encourage industry to submit more testing data. This is not expected in the present time frame for formally responding to the RAI.
2	Regarding the interval extension, is industry asking for a 15-month grace period, or a 75 month interval?	Industry is requesting a increase of the Type C extended testing interval from the 60 months presently in NEI 94-01R2A and RegGuide1.163 to 75 months with a 9-month permissible contingency extension not to be used routinely.	NUREG-1493 and EPRI TR-104285 both supported LLRT extended intervals of up to 120 months. NEI 94-01 (rev. 0) stated 120 months as the maximum extended interval.
3	It may be possible for some plants to violate the 0.6 La criterion for Type B&C tests if a plant's admin limits are selected in a manner that routinely challenges the 0.6 La limit.	NEI 94-01R2A Section 10.2 presently requires admin limits be established and maintained in accordance with ANSI/ANS-56.8-2002 Sections 6.5 and 6.5.1. These requirements, including those for periodic review (e.g., maintenance) are considered to provide sufficient guidance and assurance for compliance.	The reported instances of exceeding administrative limits (failures) on redundant valves were only 4.7% of the reported failures. This is a very small number; as is the pathway leakage rate, and in no case was the 0.6 La criterion exceeded.

NEI Response to NRC RAI 12/3/2009 – Attachment 1

No.	NRC Question/Comment	Response	Comments
4	Is the post-1996 data directly comparable with the pre-1995 data?	No. Information provided in EPRI TR-104285 and NUREG-1493 does not support direct plant-to-plant comparison of specific valve performance with present data. A major goal of the post-1996 data collection conducted in 2010 was to address uncertainties referred to in RG1.163 regarding leak-tight performance. The leak-tight performance of valves being tested on extended intervals has been shown to be significantly better than that for the general population of valves used in the 1994 risk impact assessments.	
5	The Plant Data Summary of the Interim Report indicates that plants with only one tested valve or for a shorter testing duration have failure data weighted the same as plants with many valves.	The failure rate weighting calculation has been changed to reflect the total number of valves. The time period that testing has been performed under NEI-94-01 has been already accounted for in the failure rate calculation.	
6	Is data from 29 plants representative of the entire US fleet?	Yes	
7	NRC suggested routine collection of valve leakage performance data from industry. Presently, the only time containment leakage testing information is reported to NRC is if there is a reportable occurrence.	NEI 94-01R2a, Section 12.1 requires owner reporting of test results in accordance with applicable requirements of ANSI/ANS-56.8-2002. These reports include both ILRT reports and post outage reports and are required to be maintained by the plant operator. This information is maintained at plants and is available for inspection.	Data collection feasibility is being studied and considered.

NEI Response to NRC RAI 12/3/2009 – Attachment 1

No.	NRC Question/Comment	Response	Comments
8	Concern is expressed about possible primary system leakage heating cooling water in BWR plants.	Primary system leakage monitoring is not within the scope of containment isolation valve leakage testing.	
9	NRC position is that 60 months is the maximum extended interval for testing Type C valves. Increasing this interval will require justification.	EPRI TR-104285 (and NUREG-1493) justified extended LLRT intervals of up to 120 months. The recently collected data shows significantly better performance of valves tested on extended intervals than that assumed in the risk impact assessments that were the basis for 120 month extended intervals. The RAI response addresses the incremental risk in extending the intervals from 60 to 75 and 84 (75+9month contingency) months.	
10	The RAI response should contain language that indicates a revision to NEI-94-01 (NEI-94-01B) will refer to 75 months as the normal maximum Type C LLRT interval with a permissible 9 month extension for contingencies, not to be used routinely.	A mark-up of NEI 94-01R2A with appropriate changes has been provided.	

NRC Letter dated April 21, 2011, re: Revision 3 to NEI NUMARC 94-01

April 21, 2011

Mr. Biff Bradley, Director
Risk Assessment
Nuclear Generation Division
Nuclear Energy Institute
1776 I Street, NW, Suite 400
Washington, DC 20006-3708

SUBJECT: REVISION 3 TO NUCLEAR ENERGY INSTITUTE (NEI) NUMARC 94-01, "INDUSTRY GUIDELINE FOR IMPLEMENTING PERFORMANCE-BASED OPTION OF 10 CFR PART 50, APPENDIX J" (TAC NO. ME2164)

Dear Mr. Bradley:

On behalf of the U.S. Nuclear Regulatory Commission (NRC), I am responding to your March 29, 2011, letter (Agencywide Documents Access and Management System (ADAMS) Accession No. ML110970445), requesting the NRC review and consider for endorsement Topical Report (TR) NUMARC 94-01, Revision 3. The subject TR was included as an attachment (ADAMS Accession No. ML110970451) to the letter and is dated March 2011. In addition to TR NUMARC 94-01, Revision 3, two other attachments were also included; (1) NEI's Responses to NRC Requests for Information on Type C Containment Isolation Valve Leak-tight Performance, dated March 28, 2011 (ADAMS Accession No. ML110970448), and (2) EPRI's Type C Containment Isolation Valve Performance, Report # 1022599, Technical Update, dated March 2011 (ADAMS Accession No. ML110970450).

Section 170.21 of Title 10 of the *Code of Federal Regulations* requires that TRs be subject to fees based on the full cost of the review. However, based on the letter dated August 6, 2009 (ADAMS Accession No. ML093060238), the Office of the Chief Financial Officer has waived the 10 CFR 170.21 fees associated with the review of TR NUMARC 94-01. Any reviews of subsequent revisions to this TR will be in accordance with 10 CFR 170.21, and any desired fee waivers must be requested.

Upon receipt of the documents from NEI, the NRC's staff noted an administrative error in the document numbers. Although there are references to NUMARC 91-04, the NRC understands that the guidelines for implementing Appendix J are contained within NUMARC 94-01.

During the initial review of the cover letter and attachments, the NRC staff noted references to the "restoration of the 75-month interval for Type C testing" and the staff clarifies that 10 CFR Part 50, Appendix J, Option B does not allow a permanent or scheduled extension of the 60-month (five-year) testing interval for Type C components. The final rule did allow a 25 percent (15-month) margin in testing frequency. Therefore, the review and consideration for acceptance and endorsement of TR NUMARC 94-01, Revision 3, will consider the extension of the 60-month interval to 75 months.

NRC Letter dated April 21, 2011, re: Revision 3 to NEI NUMARC 94-01

In addition, during a very preliminary review of the EPRI Report # 1022599 Technical Update, the NRC staff concluded that the EPRI focus was on local leak rate test (LLRT) individual "failures" (each plant's staff determines what leakage value results in a "failure" for each of their valves) with little attention to how close units operate to the 0.6 La combined Type B and C Technical Specification leakage criterion. This may incorrectly result in a condition for desired routine scheduling of Type C tests beyond 60-months, and may result in an understatement of the min-pathway total.

The NRC staff will consider the responses to the request for additional information and determine if sufficient data has been provided to satisfy staff's concerns of Type C component performance. The NRC staff expects to complete a review of all submitted information by May 27, 2011. However, the schedule is based on current NRC plans and workload, and may be impacted by other higher priority tasks assigned by management.

As with all TRs, the SE will be reviewed by the NRC's Office of the General Counsel (OGC) for determination of any impact by the Congressional Review Act (CRA). This review by OGC ensures that any endorsement or acceptance of a TR by the NRC is considered with respect to being a rule according to the CRA. If this initial review by OGC determines the SE, with its accompanying TR, may be a rule, the NRC will forward the package to the Office of Management and Budget (OMB) for continued review and consideration. Any review by OMB would impact the schedule for the final issuance of the SE.

If you have any questions regarding this matter, I may be reached at 301-415-1847 or Sheldon.Stuchell@nrc.gov.

Sincerely,

/RA/

Sheldon D. Stuchell, Senior Project Manager
Licensing Processes Branch
Division of Policy and Rulemaking
Office of Nuclear Reactor Regulation

Project No. 689

NEI Response to NRC 4/21/2011 letter, dated June 9, 2011

NUCLEAR ENERGY INSTITUTE

Biff Bradley
DIRECTOR
RISK ASSESSMENT
NUCLEAR GENERATION DIVISION

June 9, 2011

Mr. Sheldon D. Stuchell
Sr. Project Manager, Division of Policy & Rulemaking
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

Subject: Information to Support Proposed Revision 3 to NUMARC 94-01, *Industry Guideline for Implementing Performance-Based Option of 10 CFR Part 50, Appendix J*

Project Number: 689

Dear Mr. Stuchell:

NRC's letter dated April 21, 2011, provided initial comments on NEI's request for review and endorsement of proposed Revision 3 to NUMARC 94-01. In particular, the letter noted the following:

> In addition, during a very preliminary review of the EPRI Report #1022599 Technical Update, the NRC staff concluded that the EPRI focus was on local leak rate test (LLRT) individual "failures" (each plant's staff determines what leakage value results in a "failure" for each of their valves) with little attention to how close units operate to the 0.6 La combined Type B and C Technical Specification leakage criterion. This may incorrectly result in a condition for desired routine scheduling of Type C tests beyond 60months, and may result in an understatement of the min-pathway total.

During a May 3, 2011 phone call, NEI agreed to provide a revised version of Section 12.1 of NUMARC 94-01, R3 to address the above. This would revise reporting expectations to include a report of the margin between the type B and C test results and the regulatory limit. This revised paragraph is provided for your consideration. Also attached is a version of NUMARC 94-01 incorporating this revision. We understand NRC is continuing their review of the document; however, if no further requests for additional information are identified, we respectfully request that NRC provide a safety evaluation for the attached version of NUMARC 94-01, R3.

If you have any questions or require additional information, please contact me at 202.739.8083, reb@nei.org.

Sincerely,

Biff Bradley

Attachments

ATTACHMENT 1

Revised Paragraph Section 12.1 of NUMARC 94-01, R3

12.0 RECORDKEEPING

12.1 Report Requirements

A post–outage report shall be prepared presenting results of the previous cycle's Type B and Type C tests, and Type A, Type B, and Type C tests, if performed during that outage. The technical contents of the report are generally described in ANSI/ANS-56.8–2002, and shall be available on–site for NRC review. The report shall ~~also~~ show that the applicable performance criteria are met, and serve as a record that continuing performance is acceptable. The report shall also include the margin between the Type B and Type C leakage rate summation and its regulatory limit. Adverse trends in the Type B and Type C leakage rate summation shall be identified in the report and a corrective action plan developed to restore the margin to an acceptable level.