Watts Bar Nuclear Plant (WBN)

Pre-Submittal Meeting for License Amendment Request
Technical Specification 5.7.2.19
Use of NEI 94-01 Rev 3-A Methodology for CILRT Intervals

August 27, 2020

Agenda

- Opening Remarks
- Background
- Current Requirements
- Nuclear Energy Institute (NEI) 94-01 Revision 3-A and Revision 2-A
- Limitations & Conditions
- Plant-Specific Confirmatory Analysis
- Proposed Technical Specification (TS) Change
- Basis for Proposed Change
- Performance History
- Precedent
- Schedule Milestones
- Closing Remarks

Opening Remarks

- The purpose of this meeting is to discuss a proposed license amendment for WBN.
- Tennessee Valley Authority (TVA) is requesting a license amendment to revise WBN TS 5.7.2.19, "*Containment Leakage Rate Testing Program"* to add the guidelines contained in NEI 94-01, "*Industry Guideline for Implementing Performance-Based Option of 10 CFR 50, Appendix J*," Revision 3-A, dated July 2012, with the conditions and limitations specified in NEI 94-01, Revision 2-A, October 2008.
- This presentation will discuss the basis for the proposed TS changes.

Background

- TVA has previously adopted NEI 94-01, Rev 3-A for the Containment Leakage Rate Programs at Browns Ferry (BFN) and Sequoyah (SQN).
- The same technical team that developed the SQN and BFN LARs to adopt NEI 94-01, Rev 3-A, also developed this LAR for WBN.
- The TVA fleet-wide Containment Leakage Rate Program governing procedure already contains all of the necessary requirements and processes to ensure compliance with NEI 94-01, Rev 3-A and associated NRC conditions.

Current Requirements

- The existing WBN TS 5.7.2.19 Containment Leakage Rate Testing Program requires compliance with Regulatory Guide (RG) 1.163 for implementation of 10CFR50, Appendix J, Option B.

- RG 1.163 endorses use of NEI 94-01, Rev 0, for establishing performance based test intervals, with certain exceptions, that allow Type A test interval up to 10 years, Type B test interval up to 120 months, and Type C test interval up to 60 months.

- RG 1.163 also clarifies that ANSI-56.8-1994 is to be used for the technical methods and techniques for performing Types A, B, and C tests.

NEI 94-01 Revision 3-A and Revision 2-A

- Major changes in NEI 94-01, from Rev 0 to 3-A
  - Incorporates the regulatory positions from RG 1.163,
  - Updates the technical methods reference to ANSI 56.8-2002, and
  - Increases the maximum Type A test interval from 10 to 15 years and Type C test interval from 60 to 75 months.

- The NRC SER for NEI 94-01, Rev 3-A includes two conditions for use.

- Based on previous submittals and associated SERs, TVA understands the need to meet the Limitations and Conditions in the SER for NEI 94-01, Rev 2-A. There are six conditions related to leakage rate testing and four conditions related to probabilistic risk analysis (PRA).

Response to Limitations and Conditions related to leak rate testing

- NEI 94-01 Revision 3-A SER Section 4.0

Condition 1 presents three separate items that are required to be addressed.

1a. 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.

The post-outage report will include the margin between the Type B and Type C Minimum Pathway Leak Rate (MNPLR) summation value, as adjusted to include the estimate of applicable Type C leakage understatement, and its regulatory limit of 0.60La. WBN will establish an administrative limit to provide margin to the regulatory limit of 0.60La.

Response to Limitations and Conditions related to leak rate testing

- NEI 94-01 Revision 3-A SER Section 4.0

1b. In addition, a corrective action plan shall be developed to restore the margin to an acceptable level.

When the potential leakage understatement adjusted Types B and C MNPLR total is greater than the WBN administrative leakage summation limit, but less than the regulatory limit of 0.60La, then an analysis and determination of a corrective action plan will be prepared to restore the leakage summation margin to less than the WBN leakage limit. The corrective action plan will focus on those components which have contributed the most to the increase in the leakage summation value and the manner of timely corrective action, as deemed appropriate, that best focuses on the prevention of future component leakage performance issues so as to maintain an acceptable level of margin.

Response to Limitations and Conditions related to leak rate testing

- NEI 94-01 Revision 3-A SER Section 4.0

1c. Use of the allowed 9-month extension for eligible Type C valves is only authorized for non-routine emergent conditions.

TVA will apply the 9-month extension period only to eligible Type C components for non-routine emergent conditions. Such occurrences will be documented in the record of tests.

Response to Limitations and Conditions related to leak rate testing

- NEI 94-01 Revision 3-A SER Section 4.0

Condition 2 presents two separate items that are required to be addressed.

2a. Extending the LLRT intervals beyond 60-months and up to 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 TR 94-01, Revision 3, Section 12.1.

> *The change from a 60-month test interval to a 75-month interval is an increase of 25%. TVA will apply a potential leakage understatement adjustment factor to the actual As-Left leak rate. This will result in a combined conservative Type C total for all 75-month LLRTs being "carried forward" and will be included whenever the total leakage summation is required to be updated (either while on line or following an outage).*

Response to Limitations and Conditions related to leak rate testing

- NEI 94-01 Revision 3-A SER Section 4.0

2b. 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 Types B and 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.

A post-outage report is prepared with results of the tests performed during that outage. The report will show that the applicable performance criteria are met and serve as a record that continuing performance is acceptable. If an adverse trend in the potential leakage understatement is identified, then a corrective action plan is prepared, focused on those components which have contributed the most to the adverse trend in the leakage summation value.

Response to Limitations and Conditions related to leak rate testing

- NEI 94-01 Revision 2-A SER Section 4.1

1. For calculating the Type A leakage rate, the licensee should use the definition in the NEI TR 94-01, Revision 2, in lieu of that in ANSI/ANS-56.8-2002.

TVA will utilize the definition in NEI 94-01, Revision 3-A, Section 5.0. This definition has remained unchanged from Revision 2-A to Revision 3-A of NEI 94-01.

2. The licensee submits a schedule of containment inspections to be performed prior to and between Type A tests.

This schedule is discussed in the LAR.

Response to Limitations and Conditions related to leak rate testing

- NEI 94-01 Revision 2-A SER Section 4.1

3. The licensee addresses the areas of the containment structure potentially subjected to degradation.

Results of containment ISI, visual examinations, moisture barrier examinations, and containment coating inspections are provided to demonstrate good containment integrity history at WBN.

4. The licensee addresses any tests and inspections performed following major modifications to the containment structure, as applicable.

Tests and inspections performed following major modifications to the containment structure are discussed in the LAR.

Response to Limitations and Conditions related to leak rate testing

- NEI 94-01 Revision 2-A SER Section 4.1

5. The normal Type A test interval should be less than 15 years. If a licensee has to utilize the provision of Section 9.1 of NEI TR 94-01, Revision 2, related to extending the ILRT interval beyond 15 years, the licensee must demonstrate to the NRC staff that it is an unforeseen emergent condition.

TVA will follow the requirements of NEI 94-01, Revision 3-A, Section 9.1. This requirement has remained unchanged from Revision 2-A to Revision 3-A of NEI 94-01.

6. For plants licensed under 10 CFR Part 52, applications requesting…….

Not applicable. WBN was not licensed under 10 CFR Part 52.

Response to Limitations and Conditions related to PRA

- NEI 94-01 Revision 2-A SER Section 4.2

1. The licensee submits documentation indicating that the technical adequacy of their PRA is consistent with the requirements of RG 1.200 relevant to the CILRT extension application.

WBN PRA technical adequacy is addressed in Section 4.0 of the PRA Evaluation provided in this LAR.

Response to Limitations and Conditions related to PRA

- NEI 94-01 Revision 2-A SER Section 4.2

2a. The licensee submits documentation indicating that the estimated risk increase associated with permanently extending the CILRT surveillance interval to 15 years is small, and consistent with the clarification provided in Section 3.2.4.5 of this SE.

The containment Type A ILRT does not mitigate support core damage mitigation; however, it does identify potential leakage paths from within containment to the environment. The relevant figure of merit is the large early release frequency (LERF). Using the methodology from the EPRI guidance, the increase in LERF resulting from a change in the Type A ILRT test interval from 3 tests-in-10 years to 1 test-in-15 years is estimated as 1.90E-07/year for both units (internal events and external events). The total LERF is 1.61E-6/year for Unit 1 and 1.60E-6/year for Unit 2. As such, the estimated change in LERF is determined to be "small" using the acceptance guidelines of RG 1.174.

Response to Limitations and Conditions related to PRA

- NEI 94-01 Revision 2-A SER Section 4.2

2b. Specifically, a small increase in population dose should be defined as an increase in population dose of less than or equal to either 1.0 person-rem per year or 1% of the total population dose, whichever is less restrictive.

The postulated impact on the population dose and dose-rate resulting from changing the Type A test frequency to the proposed licensing basis from the original licensing basis (OLB) of 3 tests-in-10 years to 1 test-per-15 years is determined using the method discussed in EPRI report on the Risk Impact Assessment of Extended Containment Integrated Leak Rate Testing Intervals. (continued)

Response to Limitations and Conditions related to PRA

- NEI 94-01 Revision 2-A SER Section 4.2

2b. (continued)

The impact is measured as an increase to the total integrated plant dose for those accident sequences influenced by Type A testing, is 0.058 person-rem/year, or 0.4% (both units). NEI 94-01 states that a small population dose is defined as an increase of ≤ 1.0 person-rem per year, or ≤ 1% of the total population dose, whichever is less restrictive for the risk impact assessment of the extended ILRT intervals. The results of this evaluation meet these criteria. Moreover, the risk impact for the ILRT extension when compared to severe accident risks is negligible.

Section 7.3 of the PRA Evaluation presents the population dose information.

Response to Limitations and Conditions related to PRA

- NEI 94-01 Revision 2-A SER Section 4.2

2c. In addition, a small increase in CCFP should be defined as a value marginally greater than that accepted in a previous one-time 15-year ILRT extension requests. This would require that the increase in CCFP be less than or equal to 1.5 percentage point.

The increase in the conditional containment failure probability (CCFP) from the 3 tests-in-10 years interval to 1 test-in-15 years interval is 0.908%. NEI 94-01 states that an increase in CCFP of ≤ 1.5% is small. Therefore, this increase is judged to be small.

Section 7.4 of the PRA evaluation presents the conditional containment failure probability information.

Response to Limitations and Conditions related to PRA

- NEI 94-01 Revision 2-A SER Section 4.2

3. The methodology in EPRI Report No. 1009325, Revision 2, is acceptable except for the calculation of the increase in expected population dose (per year of reactor operation). In order to make the methodology acceptable, the average leak rate for the preexisting containment large leak rate accident case (accident case 3b) used by the licensees shall be 100 La instead of 35 La.

EPRI Class 3b represents a Large, pre-existing Leak in the Containment liner. All core damage accident progression bins with a pre-existing leak in the containment structure in excess of normal leakage (La) are characterized as >10 La. For this evaluation, the representative containment leakage for Class 3b sequences used by WBN is 100 La, based on the guidance provided in EPRI Report No. 1018243.

Response to Limitations and Conditions related to PRA

- NEI 94-01 Revision 2-A SER Section 4.2

4. A LAR is required in instances where containment over-pressure is relied upon for ECCS performance.

WBN does not credit containment overpressure for ECCS performance.

Plant-Specific Confirmatory Analysis

- The following metrics are addressed independently in the LAR for each unit.
  - Total Large Early Release Frequency (LERF)
  - Change in LERF
  - Change in the Conditional Containment Failure Probability
  - Change in the Population Dose

Unit 1			
Metric	**Value**	**Acceptance Criteria**	**Acceptable for Application?**
$LERF_{IE\text{-}Total\ PLB}$	1.37E-06/yr	<1.0E-05/rx-yr	Yes
$LERF_{Total(IE\ \&\ EE)\ PLB}$	1.61E-06/yr		
$\Delta LERF_{Total(OLB \rightarrow CLB)\ EE\&IE}$	1.11E-07/yr	<1.0E-06/rx-yr	Yes
$\Delta LERF_{Total(OLB \rightarrow PLB)\ EE\&IE}$	1.90E-07/yr		
$\Delta CCFP_{(OLB \rightarrow CLB),\ Inc.\ Corrosion}$	0.529%	≤ 1.5%	Yes
$\Delta CCFP_{(OLB \rightarrow PLB),\ Inc.\ Corrosion}$	0.908%		
$\Delta DOSE_{(OLB \rightarrow CLB)}$	3.37E-02 per-rem/yr	<1.0 person-rem/yr or <1% of total dose, whichever is less restrictive.	Yes
$\Delta DOSE_{(OLB \rightarrow PLB)}$	5.75E-02 per-rem/yr		
$\Delta\%DOSE_{(OLB \rightarrow CLB)}$	0.24%		
$\Delta\%DOSE_{(OLB \rightarrow PLB)}$	0.41%		
Unit 2			
$LERF_{IE\text{-}Total\ PLB}$	1.36E-06	<1.0E-05/rx-yr	Yes
$LERF_{Total(IE\ \&\ EE)\ PLB}$	1.60E-06		
$\Delta LERF_{Total(OLB \rightarrow CLB)\ EE\&IE}$	1.11E-07	<1.0E-06/rx-yr	Yes
$\Delta LERF_{Total(OLB \rightarrow PLB)\ EE\&IE}$	1.90E-07		
$\Delta CCFP_{(OLB \rightarrow CLB),\ Inc.\ Corrosion}$	0.529%	≤ 1.5%	Yes
$\Delta CCFP_{(OLB \rightarrow PLB),\ Inc.\ Corrosion}$	0.908%		
$\Delta DOSE_{(OLB \rightarrow CLB)}$	3.34E-02 per-rem/yr	<1.0 person-rem/yr or <1% of total dose, whichever is less restrictive.	Yes
$\Delta DOSE_{(OLB \rightarrow PLB)}$	5.76E-02 per-rem/yr		
$\Delta\%DOSE_{(OLB \rightarrow CLB)}$	0.24%		
$\Delta\%DOSE_{(OLB \rightarrow PLB)}$	0.42%		

Proposed Technical Specification Change

Unit 1 - TS 5.7.2.19 Containment Leakage Rate Testing Program

5.7.2.19 Containment Leakage Rate Testing Program

A program shall be established to implement the leakage rate testing of the containment as required by 10 CFR 50.54(o) and 10 CFR 50 Appendix J, Option B, as modified by approved exemptions. This program shall be in accordance with the guidelines contained in NEI 94-01, "Industry Guideline for Performance-Based Option of 10 CFR 50, Appendix J," Revision 3-A, July 2012, and Section 4.1, "Limitations and Conditions for NEI TR 94-01, Revision 2," of the NRC Safety Evaluation Report in NEI 94-01, Revision 2-A, dated October 2008, as modified below:

For containment leakage rate testing purposes, a value of 15.0 psig, which is equivalent to the maximum allowable internal containment pressure, is utilized for Pa to bound a range of peak calculated containment internal pressures from 9.0 to 15.0 psig for the design basis loss of coolant accident.

Proposed Technical Specification Change

Unit 2 - TS 5.7.2.19 Containment Leakage Rate Testing Program

5.7.2.19 Containment Leakage Rate Testing Program

A program shall be established to implement the leakage rate testing of the containment as required by 10 CFR 50.54(o) and 10 CFR 50 Appendix J, Option B, as modified by approved exemptions. This program shall be in accordance with the guidelines contained in NEI 94-01, "Industry Guideline for Performance-Based Option of 10 CFR 50, Appendix J," Revision 3-A, July 2012, and Section 4.1, "Limitations and Conditions for NEI TR 94-01, Revision 2," of the NRC Safety Evaluation Report in NEI 94-01, Revision 2-A, dated October 2008, as modified below:

For containment leakage rate testing purposes, a value of 15.0 psig, which is equivalent to the maximum allowable internal containment pressure, is utilized for P_a to bound a range of peak calculated containment internal pressures from 9.0 to 15.0 psig for the design basis loss of coolant accident.

Basis for Proposed Changes

TS 5.7.2.19 Containment Leakage Rate Testing Program

- WBN will comply with the provisions of Option B in Appendix J to 10 CFR Part 50 in accordance with the following:
  - NEI 94-01 Revision 3-A
  - Limitations & Conditions set forth in NRC Safety Evaluations for NEI 94-01 Rev 3-A and Rev 2-A
  - ANSI 56.8-2002 - with two technical deviations related to the use of a bounding value for Pa

Basis for Proposed Changes

TS 5.7.2.19 Containment Leakage Rate Testing Program

- Use of a bounding value for Pa
  - TVA is requesting to use a bounding value of 15.0 psig for Pa, in place of the calculated Pa value as defined in 10 CFR 50, Appendix J, Option B, Section II Definitions and ANSI/ANS 56.8, Section 2 Definitions.
  - The current calculated Pa value is 9.36 psig for both Unit 1 and Unit 2 as shown in UFSAR Chapter 6.2.1.3.3 Long-Term Containment Pressure Analysis. For the purposes of this submittal, a lower limit of 9.0 psig for the calculated Pa was used in evaluating acceptability for the bounding Pa of 15.0 psig.
  - The purpose in requesting a bounding value for Pa is to minimize the impact on related documents when the calculated Pa is changed.

Basis for Proposed Changes

TS 5.7.2.19 Containment Leakage Rate Testing Program

- Deviations from ANSI 56.8 related to use of a bounding Pa

  - Use of a bounding value for Pa of 15.0 psig in lieu of the calculated value for Pa of 9.36 psig results in a increase in allowable leak rate (La).

Pa	La
9.36 psig	199.67 scfh
15.00 psig	246.48 scfh

  - The increase in La due to use of a bounding Pa of 15.0 psig has been included as part of WBN accident analysis (i.e., dose rates) since startup and commercial operation of each unit. Therefore, this deviation is considered a technicality that does not have any adverse effects.

Basis for Proposed Changes

TS 5.7.2.19 Containment Leakage Rate Testing Program

- Deviations from ANSI 56.8 related to use of a bounding Pa

  - Use of a bounding value for Pa of 15.0 psig in lieu of the calculated value for Pa of 9.36 psig results in a increase in the maximum allowable test pressure (1.1 Pa) for those components where a higher differential pressure results in increased sealing.

Pa	1.1 Pa
9.36 psig	10.30 psig
15.00 psig	16.50 psig

  - TVA contracted with Kalsi Engineering to perform a detailed evaluation.

Basis for Proposed Changes

TS 5.7.2.19 Containment Leakage Rate Testing Program

- Evaluation of increased maximum allowable test pressure (1.1 Pa)
  - All WBN components that are Type B and Type C tested were reviewed to identify the scope of components where a higher differential pressure "may" increase sealing. This subset scope of components was then evaluated in more detail.
  - The purpose of the detailed evaluation was to determine whether an increase in seat leakage is expected when the differential pressure (LLRT test pressure) is reduced from 16.5 psig to 9.0 psig.
  - The maximum LLRT test pressure of 16.5 psig (1.1 times the historical Pa value of 15.0 psig) is the current and historical maximum LLRT test pressure allowed by WBN specific LLRT procedures.

Basis for Proposed Changes

TS 5.7.2.19 Containment Leakage Rate Testing Program

- The scope of components were grouped by internal design and evaluation methodology
  - > Upon closer examination, a small population of the components were determined to be designed such that test pressure is effectively balanced and there is no significant change in seat load as a function of LLRT test DP. These components were excluded from further evaluation.
  - > Five groups of components were evaluated in detail; MOV Gate Valves, MOV/AOV Plug Valves, Soft-Seated and Hard Seated Swing Check Valves, Lift Check Valves, and AOV Globe Valves.
- The detailed evaluation determined that an increase in leakage is not expected when the LLRT test pressure is reduced from 16.5 psig to a bounding lower limit of 9.0 psig

Performance History

- Leakage Test History
  - Type A and Type C test results are provided to demonstrate good leakage rate history at WBN.
- Containment Inspections
  - Results of containment ISI, visual examinations, moisture barrier examinations, and containment coating inspections are provided to demonstrate good containment integrity history at WBN
- NRC Information Notices (IN) and Regulatory Issue Summaries (RIS)
  - Results of the review of applicable IN and RIS are provided to demonstrate how such information is used to inform the programs for maintaining the overall containment integrity at WBN.

Precedent: Containment Leakage Rate Test Pressure

- NRC License Amendment for Millstone Power Station, Unit 2, dated March 31, 2016 (ML16068A312)
  - NRC approved an amendment to allow containment leakage rate testing to be performed at a pressure greater than 1.1 Pa, where Pa is the peak calculated primary containment internal pressure.

- NRC License Amendment for Donald C. Cook Nuclear Plant, Units 1 and 2, dated June 7, 2017 (ML17131A277)
  - NRC approved an amendment to revise TS 5.5.14, "Containment Leakage Rate Testing Program," to allow testing to be performed at a pressure greater than 1.1 times the calculated peak containment pressure.

Precedent: Test Intervals

- NRC License Amendment for Sequoyah Nuclear Plant, Units 1 and 2, dated November 30, 2015 (ML15320A218)
  - NRC approved an amendment to adopt NEI 94-01, Revisions 2-A and 3-A, to permanently extend the Type A test interval from 10 years to 15 years, and to permanently extend the Type C test interval from 60 months to a maximum of 75 months.
- NRC License Amendment for Browns Ferry Nuclear Plant, Units 1, 2, and 3, dated September 27, 2018 (ML18251A003)
  - NRC approved an amendment to adopt NEI 94-01, Revisions 2-A and 3-A, to permanently extend the Type A test interval from 10 years to 15 years, and to permanently extend the Type C test interval from 60 months to a maximum of 75 months.
- NRC License Amendment for Point Beach Nuclear Plant, Units 1 and 2, dated April 25, 2019 (ML19064A904)
  - NRC approved an amendment to adopt NEI 94-01, Revisions 2-A and 3-A, to permanently extend the Type A test interval up to 15 years, and to permanently extend the Type C test interval up to a maximum of 75 months.

Precedent: Test Intervals

- NRC License Amendment for Brunswick Steam Electric Plant, Units 1 and 2, dated February 6, 2020 (ML19346C792)
  - NRC approved an amendment to adopt NEI 94-01, Revisions 2-A and 3-A, to permanently extend the Type A test interval from 10 years to 15 years, and to permanently extend the Type C test interval from 60 months to a maximum of 75 months.
- NRC License Amendment for Limerick Generating Station, Units 1 and 2, dated March 11, 2020 (ML19351E376)
  - NRC approved an amendment to adopt NEI 94-01, Revisions 2-A and 3-A, to permanently extend the Type A test interval from 10 years to 15 years, and to permanently extend the Type C test interval from 60 months to a maximum of 75 months.
- NRC License Amendment for Millstone Power Station Unit 3, dated July 15, 2020 (ML20161A000)
  - NRC approved an amendment to adopt NEI 94-01, Revisions 2-A and 3-A, to permanently extend the Type A test interval from 10 years to 15 years, and to permanently extend the Type C test interval from 60 months to a maximum of 75 months.

Schedule Milestones

- August 27, 2020 – LAR Pre-Submittal Meeting with NRC
- September 2020 – LAR Submittal – Request NRC approval within 12 months of submittal with 30-day implementation
- October 2020 – Telecon or meeting to discuss any NRC questions
- September 2021 – NRC Approval of LAR (Requested)

Closing Remarks


TVA