Watts Bar Nuclear Plant Unit 2

Pre-Submittal Teleconference for Proposed License Amendment Request Regarding Technical Specification 5.9.9, “Steam Generator Tube Inspection Report,” to use POPCD Methodology

Agenda

- Opening Remarks and Purpose of the Proposed LAR
- Proposed Technical Specification 5.9.9 Changes
- Introduction
- Existing SG Tube Degradation Mechanisms post U2R3 Inspection
- Preliminary GL95-05 Operational Assessment (OA) Predictions
- Probability of Detection (POD)
- Purpose of WBN 2 POPCD
- Regulatory Precedent
- Schedule for Submittal
- Summary and Closing Remarks

Opening Remarks and Purpose of the Proposed LAR

- The proposed Technical Specification (TS) amendment revises the Watts Bar Nuclear Plant (WBN) Units 2 TS 5.9.9, “Steam Generator Tube Inspection Report” to add reporting requirement for the Probability of Prior Cycle Detection (POPCD) methodology.

- Use of POPCD requires NRC approval.

Proposed WBN 2 TS 5.9.9 Change

5.9 Reporting Requirements (continued)

5.9.9 Steam Generator Tube Inspection Report (continued)

For implementation of the probability of prior cycle detection (POPCD) method, for the voltage-based repair criteria at tube support plate intersections, if the end-of-cycle conditional tube rupture probability for a postulated main steam line break, the projected primary to secondary leak rate during a postulated main steam line break, or the number of indications are under predicted by the previous cycle operational assessment, the following shall be reported to the Commission within 90 days after initial entry into MODE 4 following completion of the inspection performed in accordance with Technical Specification 5.7.2.12, "Steam Generator (SG) Program."

1. The assessment of the probable causes for the under prediction, proposed corrective actions, and any recommended changes to probability of detection or growth methodology indicated by potential methods assessments.
2. An assessment of the potential need to revise the alternate repair criteria analysis methods if the burst probability is under predicted by more than 0.001 (i.e., 10 percent of the performance criteria) or an order of magnitude; or the leak rate is under predicted by more than 0.5 gallon perminute (gpm) or an order of magnitude.
3. An assessment of the potential need to increase the number of predicted low voltage indications at the beginning of cycle if the total number of as-found indications in any SG are underestimated by greater than 15 percent or by greater than 150 indications.

5.10 Record Retention

(removed from Technical Specifications)

Introduction

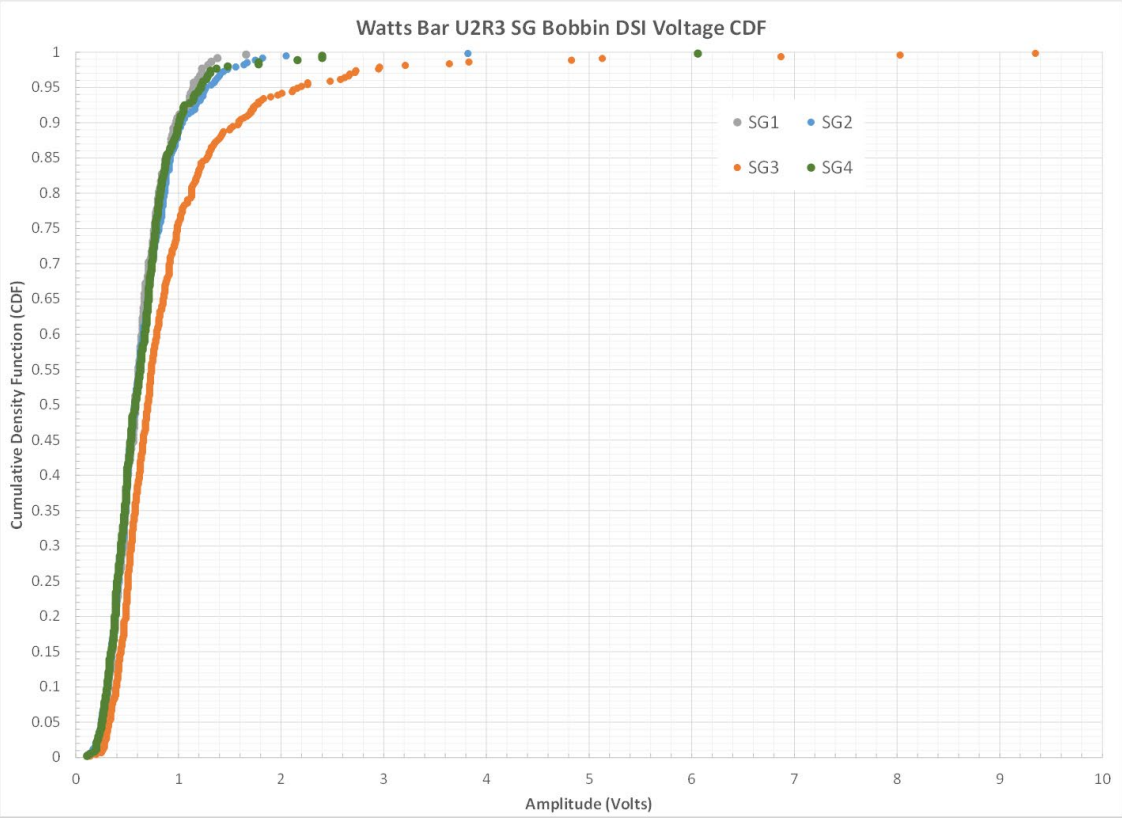
- WBN U2R3 is the 3rd ISI for the Unit 2 Model D3 SGs (Alloy 600MA).
- This was the first outage to implement GL95-05 Voltage Based Repair Criteria (ARC).
- Significant Inspection scope was performed.
- SG-3 did not pass GL95-05 criteria for conditional probability of burst.

Existing SG Tube Degradation Mechanisms post U2R3 Inspection

- Volumetric Indications due to Tube Fabrication and Installation
- Mechanical Wear at Anti-Vibration Bars
- Mechanical Wear at Tube Support Plates
- Circumferential ODSCC at the Hot Leg Top of Tubesheet
- Axial ODSCC at the Hot Leg Top of Tubesheet **(New)**
- Axial PWSCC at the Hot Leg Top of Tubesheet **(New)**
- Circumferential ODSCC at Freespan Dings **(New)**
- Axial ODSCC at Freespan Dings **(New)**
- Axial ODSCC at TSPs – GL 95-05
- Axial ODSCC at the FDB – GL 95-05 **(New)**

- Condition Monitoring requirements met for all degradation mechanisms **except for GL 95-05 conditional burst probability in SG3** (WBN 2 TS 5.9.9 Item 5)

U2R3 SG Bobbin DSI Voltage CDF



Probability of Detection (POD)

- GL95-05 Section 2.b.1
  - Requires BOC distribution of bobbin DSIs to be scaled upward by factor of 1/POD
  - Conservatively accounts for non-detected crack indications that are assumed to be returned to service.
  - “POD should be assumed to have a value of 0.6, or as an alternative, an NRC approved POD function can be used, if such a function becomes available.”
  - Substantial industry data shows a POD of 1.0 in the range of 3-4 volts.
  - No undetected indication has exceeded 3.2v (EPRI NP-7490, Add 7)

Preliminary GL95-05 Operational Assessment (OA) Predictions

- Using the POD value of 0.6 is limiting for WBN 2.
- Short Term-POD of 1.0 is used to support operation for select flaws.
- Longer Term-POPCD
- POPCD precedent – Sequoyah Nuclear Plant (SQN) Unit 2, Diablo Canyon Units 1 and 2.

Preliminary GL95-05 Operational Assessment (OA) Predictions

	Effective Full Power Days (EFPD)	POD
SG 1	503.9	0.6
SG 2	503.9	0.6 up to 3.2v 1.0≥3.2v
SG 3	270	POPCD Preliminary
	240	0.6 up to 3.2v 1.0≥3.2v
	180	0.6 up to 8v 1.0≥8v
SG 4	503.9	0.6 up to 3.2v 1.0≥3.2v

Purpose of WBN 2 POPCD

- WBN U2R3 inspection results didn’t support a cycle length of 90 days due to POD of 0.6.
- POPCD will allow a more realistic POD.

POPCD Definition

- POPCD is calculated as the ratio of indications reported at the prior inspection to the total indications found at the subsequent inspection.

$$\text{POPCD} = \frac{\text{EOC}_{n+1}\text{ RPC confirmed plus not RPC inspected and bobbin detected at EOC}_n \;+\; \text{EOC}_n\text{ bobbin detected, RPC confirmed plus not RPC inspected and repaired at EOC}_n}{\text{EOC}_{n+1}\text{ RPC confirmed plus not RPC inspected and bobbin detected at EOC}_n \;+\; \text{EOC}_n\text{ bobbin detected, RPC confirmed plus not RPC inspected and repaired at EOC}_n \;+\; \text{New EOC}_{n+1}\text{ RPC confirmed or only RPC detected plus not RPC inspected indications (i.e., not detected at EOC}_n\text{)}}$$

POPCD Definition

- Premise-all indications that can contribute significantly to burst and leakage for GL95-05 can be confirmed with RPC or equivalent.
- Treats all new indications at an inspection as having been undetected at the prior inspection.
- Supported by industry POPCD database of 42 inspections.
- Industry data includes 9 inspections of high noise plant data. No undetected indications exceeded 3.2 volts.

Voltage Bin Example from SQN 2 (Cycle 12) Reference ML070250031, Table 4

- Voltage Bins Range for each 0.1v
- Voltage Bin (0.91v-1.00v)
  - Determine the total for Detection at EOCn-These are from previous cycle. (58 indications)
  - Determine at No Detection at EOCn (New Indications)-These are from the subsequent cycle. (9)
  - POPCD for Voltage Bin 0.866.
- Build table for each voltage bin using number of indications for each category and calculate POPCD.

Noise Considerations

- TSP ODSCC indications are dominantly located near the center of the TSP.
- WBN 2 has relatively low bobbin noise measurements at the TSP center.
- Preliminary POPCD indicated potential improved detection of axial ODSCC at TSP center for large voltage indications.
- Noise Monitoring performed during U2R3.

Conclusion

- Short term use of 1.0 POD factor for DSIs $\geq$ 8 Volts
- Short term use of 1.0 POD factor for DSIs $\geq$ 3.2 Volts
- LAR for application of POPCD method
- Evaluating the use of WBN 1 data to support WBN 2 specific POPCD

Regulatory Precedent

- On March 24, 2008, NRC issued a license amendment for SQN Unit 2, which revised approved the use of the POPCD methodology and revised the SG TS reporting requirement to reflect the use of POPCD (ML080710575).
- On October 28, 2004, NRC issued a license amendment for Diablo Canyon Power Plant (DCPP), Unit Nos. 1 and 2, which also approved the use of the POPCD methodology and revised the SG TS reporting requirement to reflect the use of POPCD (ML043140456).
- The proposed LAR mimics the TS changes for the SQN Unit 2 and DCCP LARs.
- TVA has reviewed the LARs and RAI responses for each of the below precedents and have addressed them, as applicable, in this enclosure.

Schedule for Submittal

- November 17, 2020 – Pre-submittal teleconference with NRC
- December 18, 2020 - Submit LAR to NRC (attempting to improve this date)
- Request NRC approval by February 8, 2021 with implementation by February 14, 2021 (i.e., 90 days from WBN 2 entering Mode 4 on November 16, 2020) to comply with the proposed 90-day reporting requirement for POPCD.

TVA