Watts Bar Nuclear Plant Unit 2 Pre-Submittal Teleconference for Proposed License Amendment to Revise the Updated Final Safety Analysis Report (UFSAR) to use an alternate Probability of Detection (POD)

Agenda

- Opening Remarks and Purpose of the Proposed License Amendment Request (LAR)
- Introduction
- Generic Letter (GL) 95-05 POD
- Watts Bar Nuclear Plant (WBN) Unit 2 Site Specific POD Technical Discussion
- Practical Demonstration of POD
- Technical Analysis Conclusions
- Proposed Updated Final Safety Analysis Report (UFSAR) Change
- Regulatory Precedent
- Schedule for Submittal
- Path Forward

Opening Remarks and Purpose of the Proposed LAR

- The proposed LAR revises the WBN dual-unit UFSAR Section 5.5.2.4 to allow the use of alternate POD for GL 95-05 operational assessments
 - POD of 0.90 for bobbin voltage amplitude of \geq 3.2 volts but < 6.0 volts
 - POD of 0.95 for bobbin voltage amplitude of \geq 6.0 volts
- Use of the proposed POD values is an alternative to the POD of 0.6 as described in GL 95-05 and requires NRC approval
- Proposed POD values will only be used until the WBN Unit 2 steam generators (SGs) are replaced
- In accordance with GL 95-05, a POD of 0.6 will be used for indications less than 3.2 volts.

Introduction

- The WBN Unit 2 cycle 3 refueling outage (U2R3) was the third inservice inspection (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 in-service inspection scope was performed.
- Condition monitoring requirements met for all degradation mechanisms except for GL 95-05 conditional burst probability in SG3 [WBN, Unit 2 Technical Specification (TS) 5.9.9 Item 5]

GL 95-05 POD

- GL95-05 Section 2.b.1
 - Requires beginning of cycle (BOC) distribution of bobbin distorted support indications (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."
 - Based on the WBN Unit 2 specific POD curve, an alternative POD can be used for larger voltage indications.

WBN U2R3 Noise

- U2R3 Noise Measurements
 - Performed using automated analysis software
 - All SGs noise was measured and compared
 - Region of interest for GL 95-05 assessments is tube support plate (TSP) centers
 - SG3 is limiting for the Operational Assessment
 - > Subset of SG3 hot leg TSPs found to be limiting
 - > Also region where majority of flaw indications were detected

Signal-to-Noise Ratio

- Signal-to-Noise Ratios Developed
 - Eddy current bobbin detection technique I28411 based largely on GL 95-05 pulled tube samples (inclusive of WBN Unit 1 samples)
 - Raw Examination Technique Specification Sheet (ETSS) data analyzed to develop signal-to-noise ratios for each data point
 - Regression developed to represent technique specific signal/noise (S/N) ratio distribution

Probability of Detection

- WBN 2 Specific Voltage-POD Function
 - Step 1: Function relating ETSS I28411 S/N to POD
 - Step 2: Linear regression function relating WBN 2 DSI Vpp to Vvm values
 - Step 3: Simulation to obtain 95% lower bound POD as a function of voltage accounting for U2R3 noise distribution.

Probability of Detection



Watts Bar U2R3 POD Application

Below are DSI indications in the SGs with greater than or equal to 3.2 volts for WBN U2R3 inspection.

SG	Row	Column	Support	Bobbin Volts	Plugged	POD
3	17	54	H01	9.35	Yes	0.95
3	12	111	H02	8.03	Yes	0.95
3	17	46	H02	6.87	Yes	0.95
4	6	36	H02	6.06	Yes	0.95
3	17	47	H02	5.13	Yes	0.90
3	14	7	H02	4.83	Yes	0.90
3	7	62	H02	3.83	Yes	0.90
2	40	53	H03	3.82	Yes	0.90
3	4	109	H03	3.64	Yes	0.90
3	48	57	H02	3.21	Yes	0.90

Practical POD Demonstration

- Signal Flaw Injection Evaluation Performed
 - Injected flaw signals into specific noisy tube locations
 - Level III eddy current analyst evaluated detectability
 - Purpose to evaluate detectability at the POD thresholds
 - Preliminary conclusion is that a detectable flaw is present in all cases

Practical POD Demonstration

Only 1.54 Vvm Noise



Practical POD Demonstration



| 13

Technical Analysis Conclusions

- POD plant-specific curve developed
 - Indications 3.2 volts and greater can be detected with a high degree of certainty
- A two step POD line below the actual 95% lower bound POD curve is proposed.
 - Short term use of 0.95 POD factor for DSIs \geq 6.0 volts
 - Short term use of 0.90 POD factor for DSIs > 3.2 volts but < 6.0 volts

Proposed WBN, Unit 2 UFSAR Section 5.5.2.4 Change

"Unit 2 Only

Steam Generator Tubing voltage-based Alternate Repair Criteria (ARC) for Axial Outside Diameter Stress Corrosion Cracking (ODSCC) at tube support plate intersections was approved by NRC (23). Implementation of ODSCC ARC using GL 95-05 ⁽²⁴⁾ as guidance is in accordance with Technical Specification inservice examination requirements and Reference 25. As an alternative to the probability of detection of 0.6 required by GL 95-05, a probability of detection (POD) of 0.9 will be applied to indications of axial ODSCC at tube support plates with bobbin voltage amplitudes of greater than or equal to 3.2 volts, but less than 6.0 volts, and a POD of 0.95 will be applied to indications of axial ODSCC at tube support plates with bobbin voltage amplitudes of greater than or equal to 6.0 volts until the Unit 2 Steam Generators are replaced⁽²⁶⁾."

- Additionally, the Reference Section in UFSAR Section 5.5 will be revised to add new Reference 26 to reflect the NRC approval of this LAR.
- There are no corresponding TS changes required to apply the proposed alternate POD values, as the associated requirements are only discussed in GL 95-05, and because WBN, Unit 2 TS 5.7.2.12 and TS 5.9.9 do not contain requirements for the bobbin POD to be used or the bobbin indications.

Regulatory Precedent

- No specific precedence for the proposed POD values for this LAR.
- However, on June 3, 2003, NRC issued a license amendment for Diablo Canyon Power Plant (DCPP), Unit No. 2, authorizing revisions to the Final Safety Analysis Report Update to incorporate the NRC approval of a POD of 1.0 to one bobbin indication, contained in a DCPP Unit No. 2 SG 4 tube at row 44, column 45 at the second tube support plate on the hot leg side (R44C45-2H), for the beginning of cycle voltage distribution for the DCPP Unit No. 2 Cycle 12 operational assessment (ML031540535).
- This LAR is similar to the above license amendment in that TVA is proposing an alternate POD value for a limited number of WBN, Unit 2 SG tubes.

Schedule for Submittal

- December 17, 2020 Pre-submittal teleconference with NRC
- December 23, 2020 Submit LAR to NRC
- Request NRC approval by February 8, 2021, with implementation by February 14, 2021 (i.e., 90 days from WBN, Unit 2 entering Mode 4 on November 16, 2020) to comply with the 90-day Operational Assessment reporting requirements in accordance with the WBN2 TS.

Path Forward

- Additional LAR needed for application of Thot adjustment for growth rate based on Arrhenius equation and reduced power operation.
- Approximate OA duration of 290 days combined with the proposed POD values discussed in this presentation
- Will allow scheduling of the mid-cycle outage in September 2021, which will be less of a peak demand.
- Timeframe for development and submittal of this LAR currently being evaluated.

Sensitivity Case Results

Case Description	Temperature	POD Function	Approximate OA Duration
No change in Thot /Alternate POD	Same as Cycle 3	0.9 at 3.2V 0.95 at 6V	270 days*
Thot Change/Alternate POD (not included in this LAR)	Thot -4F from Cycle 3	0.9 at 3.2V 0.95 at 6V	290 days

*Will result in a mid-cycle outage to perform the next SG inspection in approximately August 2021 (not desirable due to high peak demands)

