Watts Bar Nuclear Plant

Watts Bar Nuclear Plant (WBN)
Pre-submittal Meeting for License Amendment Request
to Revise Technical Specification Table 1.1-1 Regarding the Required Number of Fully Tensioned Reactor Pressure Vessel Head Closure Studs

July 10, 2023

TVA TENNESSEE VALLEY AUTHORITY

Agenda

- Introduction
- References
- Reason for the Proposed Change
- Current Technical Specification (TS) Requirements
- Proposed Technical Specification Changes
- Technical Evaluation
- Precedent
- Schedule Milestones
- Closing Remarks

Introduction

- The purpose of this meeting is to discuss a proposed license amendment request (LAR) for WBN Units 1 and 2.
- Tennessee Valley Authority (TVA) is requesting a license amendment to permanently revise WBN Units 1 and 2 Technical Specification (TS) Table 1.1-1, footnotes (b) and (c) to allow continued operation of WBN Units 1 and 2 with at least 53 of 54 reactor pressure vessel head closure bolts studs fully tensioned.
- Technical evaluation is supported by WCAP 18774 P, Revision 3, “Addendum to the Rotterdam Dockyard Company Final Stress Report for 173" P.W.R. Vessels TVA III & IV (Report No. 30749-B-030, Rev. 3) - Evaluation of One Closure Stud Out of Service for 40 Years for Watts Bar Units 1 and 2,” which has been submitted to the Nuclear Regulatory Commission (NRC).

References

1. TVA letter to NRC, CNL-23-043, “Watts Bar Nuclear Plant, Unit 1 – Emergency License Amendment Request to Relax the Required Number of Fully Tensioned Reactor Pressure Vessel Head Closure Studs in Technical Specification Table 1.1-1, ‘MODES’ (WBN-TS-23-09),” dated May 4, 2023 (ML23124A403 and ML23124A404)

2. NRC letter to TVA, “Watts Bar Nuclear Plant, Unit 1 - Issuance of Amendment No. 161 Regarding a One-Time Use Change to Footnotes Applicable to Technical Specification Table 1.1-1 ‘Modes’ (Emergency Circumstances) (EPID L-2023-LLA-0064),” dated May 5 2023 (ML23125A220)

3. TVA letter to NRC, CNL-23-044, “Transmittal of Revision 3 to WCAP-18774-P and WCAP-18774-NP, ‘Addendum to the Rotterdam Dockyard Company Final Stress Report for 173" P.W.R. Vessels TVA III & IV (Report No. 30749-B-030, Rev. 3) - Evaluation of One Closure Stud Out of Service for 40 Years for Watts Bar Units 1 and 2,’ (EPID L-2023-LLA-0064),” dated June 1, 2023 (ML23152A150 and ML23152A151)

Reason for the Proposed Change

- In Reference 1, TVA submitted a request for a one-time emergency license amendment request (LAR) for WBN) Unit 1, which was approved by the NRC in Reference 2. This emergency license amendment revised WBN Unit 1 TS Table 1.1-1, “MODES,” footnotes (b) and (c), to allow completion of the WBN Unit 1 Cycle 18 refueling outage (U1R18) and transition to WBN Unit 1 Cycle 19 operation and the subsequent Unit 1R19 with the required reactor pressure vessel head closure bolts studs fully tensioned. Specially, the revised WBN Unit 1 TS Table 1.1-1, footnotes (b) and (c) stated that the required number of head closure bolts is at least 53 of 54 bolts (WBN Unit 1 stud 34 has been removed from service). Reference 1 noted that WBN Unit 1 stud 34 had been removed from service during U1R16 in May 2020.

Reason for the Proposed Change (cont'd)

- In support of the technical evaluation of the WBN Unit 1 emergency LAR, Enclosure 2 to Reference 1 contained Westinghouse Electric Company LLC (Westinghouse) WCAP 18774 P, Revision 1, "Addendum to the Rotterdam Dockyard Company Final Stress Report for 173" P.W.R. Vessels TVA III & IV (Report No. 30749-B-030, Rev. 3) - Evaluation of One Closure Stud Out of Service for 40 Years for Watts Bar Units 1 and 2." As noted in Reference 1, due to the emergent nature of Reference 1, Enclosure 2 to Reference 1 was submitted as a proprietary document in its entirety. Therefore, in Reference 3, TVA submitted to the NRC a revision of WCAP-18774-P (i.e., WCAP-18774-P, Revision 3) with revised proprietary markings and an associated non-proprietary version.

Reason for the Proposed Change (cont'd)

- WCAP-18774-P, Revision 3, supports continued operation of WBN Units 1 and 2 with at least 53 of 54 bolts reactor pressure vessel head closure bolts studs fully tensioned. Therefore, TVA is proposing to permanently revise WBN Units 1 and 2 TS Table 1.1-1, footnotes (b) and (c) to allow continued operation of WBN Units 1 and 2 with at least 53 of 54 bolts reactor pressure vessel head closure bolts studs fully tensioned. The reference to WBN Unit 1 stud 34 being removed from service in WBN Unit 1 TS Table 1.1-1, footnotes (b) and (c) is also being removed to allow flexibility in the event that WBN Unit 1 stud 34 is returned to service.

Current WBN Unit 1 Table TS 1.1-1

Table 1.1-1 (page 1 of 1)
MODES

MODE	TITLE	REACTIVITY CONDITION (K_{eff})	% RATED THERMAL POWER (a)	AVERAGE REACTOR COOLANT TEMPERATURE (°F)
1	Power Operation	$\geq$ 0.99	> 5	NA
2	Startup	$\geq$ 0.99	$\leq$ 5	NA
3	Hot Standby	< 0.99	NA	$\geq$ 350
4	Hot Shutdown (b)	< 0.99	NA	350 > T_{avg} > 200
5	Cold Shutdown (b)	< 0.99	NA	$\leq$ 200
6	Refueling (c)	NA	NA	NA

(a) Excluding decay heat.

(b) For transitioning from the Unit 1 Cycle 18 refueling outage, through Cycle 19, and prior to Cycle 20 operation, all required reactor vessel head closure bolts fully tensioned. The required number of head closure bolts is at least 53 of 54 bolts (stud 34 has been removed from service).

(c) For transitioning from the Unit 1 Cycle 18 refueling outage, through Cycle 19, and prior to Cycle 20 operation, one or more required reactor vessel head closure bolts less than fully tensioned. The required number of head closure bolts is at least 53 of 54 bolts (stud 34 has been removed from service).

Current WBN 2 Table TS 1.1-1

Table 1.1-1 (page 1 of 1)
MODES

MODE	TITLE	REACTIVITY CONDITION (k_{eff})	% RATED THERMAL POWER [a]	AVERAGE REACTOR COOLANT TEMPERATURE (°F)
1	Power Operation	$\geq$ 0.99	> 5	NA
2	Startup	$\geq$ 0.99	$\leq$ 5	NA
3	Hot Standby	< 0.99	NA	$\geq$ 350
4	Hot Shutdown [b]	< 0.99	NA	350 > T_{avg} > 200
5	Cold Shutdown [b]	< 0.99	NA	$\leq$ 200
6	Refueling [c]	NA	NA	NA

(a) Excluding decay heat.

(b) All reactor vessel head closure bolts fully tensioned.

(c) One or more reactor vessel head closure bolts less than fully tensioned.

Proposed WBN 1 and 2 Table TS 1.1-1

Table 1.1-1 (page 1 of 1)
MODES

MODE	TITLE	REACTIVITY CONDITION (k_{eff})	% RATED THERMAL POWER [a]	AVERAGE REACTOR COOLANT TEMPERATURE (°F)
1	Power Operation	$\geq$ 0.99	> 5	NA
2	Startup	$\geq$ 0.99	$\leq$ 5	NA
3	Hot Standby	< 0.99	NA	$\geq$ 350
4	Hot Shutdown [b]	< 0.99	NA	350 > T_{avg} > 200
5	Cold Shutdown [b]	< 0.99	NA	$\leq$ 200
6	Refueling [c]	NA	NA	NA

(a) Excluding decay heat.

(b) All required reactor vessel head closure bolts fully tensioned. The required number of head closure bolts is at least 53 of 54 bolts.

(c) One or more required reactor vessel head closure bolts less than fully tensioned.

Technical Evaluation

- The technical evaluation supporting this LAR is provided in Westinghouse Electric Company LLC (Westinghouse) WCAP-18774-P and WCAP-18774-NP (References 1 and 3), which was evaluated by the NRC in Reference 2. WCAP-18774-P supports continued operation of WBN Units 1 and 2 with 53 of 54 reactor vessel head closure bolts fully tensioned. Section 5.1.4 of WCAP-18774-P specifically addresses thread engagement.
- As noted in WCAP-18774-P, the maximum stresses in the adjacent studs, the bearing stress in the closure head flange, and the sealing of the reactor vessel O-rings remain acceptable when one stud is left out of service during reactor operation. All of the stress intensities still satisfy the applicable limits of Section III of the 1971 Edition of the ASME Code with Addenda through Winter 1971, which is the construction Code used to design the Watts Bar Unit 1 and Unit 2 reactor vessels. The cumulative usage factor (CUF) less than 1.0 for the studs adjacent to the out-of-service stud permits the plant to operate for the remainder of the 40-year design life with one stud out of service to allow adequate time for contingencies regarding stud hole repair preparation and implementation.

Technical Evaluation (cont'd)

- Additionally, WBN has adopted code case (CC) N-864, which has been conditionally approved by the NRC in Regulatory Guide (RG) 1.147, "Inservice Inspection Code Case Acceptability, ASME Section XI, Division 1," Revision 20, which is incorporated by reference in 10 CFR 50.55a. The technical basis for CC N-864 is in EPRI Technical Report 3002007626, "Nondestructive Evaluation: Reactor Pressure Vessel Threads in Flange Examination Requirements," March 2016 (ML16221A068).
- The bounding preload calculated on page 6-6 of EPRI Technical Report 3002007626 is based on the largest PWR vessel ID of 173 inches and the smallest PWR stud diameter of 6 inches. The reactor vessels for WBN Unit 1 and Unit 2 have the same vessel ID of 173 inches, but the stud diameter is larger at approximately 6.75 inches. Because the WBN Unit 1 and Unit 2 design pressure and number of studs are the same as the pressure and number of studs used in the EPRI preload calculation, the WBN Unit 1 and Unit 2 preload is less than the EPRI bounding preload of 42,338 psi. In addition, the one stud out of service evaluation for WBN in WCAP-18774-P does not require a larger preload for boltup of the flanges in that condition. As a result, it is acceptable for WBN Unit 1 and Unit 2 to use Code Case N-864 even with one stud out of service.

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Precedents

The proposed changes are similar to the following NRC-approved license amendments:

- In Reference 2, NRC approved an emergency LAR for WBN Unit 1, which revised WBN Unit 1 TS Table 1.1-1, footnotes (b) and (c), to allow completion of the WBN Unit 1 Cycle 18 refueling outage (U1R18) and transition to WBN Unit 1 Cycle 19 operation and the subsequent Unit 1R19 with the required reactor pressure vessel head closure bolts studs fully tensioned. Specially, the revised WBN Unit 1 TS Table 1.1-1, footnotes (b) and (c) stated that the required number of head closure bolts is at least 53 of 54 bolts.
- Braidwood Station Units 1 and 2 and Byron Station Units 1 and 2 on October 28, 2015, in Amendment Nos. 186 and 192, respectively (ML15232A441). These amendments approved the use of the methodology for developing the pressure and temperature limits reports and changed TS Table 1.1-1, “MODES,” footnote (b) to state: “All required reactor vessel head closure bolts fully tensioned” and footnote (c) to state: “One or more required reactor vessel head closure bolts less than fully tensioned” (emphasis added). The proposed license amendment request for WBN Units 1 and 2 is not requesting changes to the pressure and temperature limits methodology.

Precedents (cont'd)

- Callaway Plant Unit 1 on May 28, 1999, in Amendment No. 133 (ML021640446). Amendment No. 133 converted the current TSs to the improved TSs. The amendment approved changes to TS Table 1.1-1 based on an NRC Safety Evaluation issued on May 26, 1988 (ML20155J379 and ML20155J490) associated with the operation of the Callaway Plant with stud #2 untensioned. Amendment No. 133 revised footnote (b) to state: "At least 53 of 54 reactor vessel head closure bolts fully tensioned and footnote (c) to state: "Two or more reactor vessel head closure bolts less than fully tensioned."

Schedule Milestones

- TVA to submit LAR to NRC by August 15, 2024.
- Request NRC approval within one year from submittal.
- 30-day implementation following NRC approval.


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