



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

July 15, 2024

James Barstow
Vice President, Nuclear Regulatory
Affairs and Support Services
Tennessee Valley Authority
1101 Market Street, LP 4A-C
Chattanooga, TN 37402-2801

SUBJECT: WATTS BAR NUCLEAR PLANT, UNITS 1 AND 2 - ISSUANCE OF
AMENDMENT NOS. 168 AND 74 REGARDING REVISION TO TECHNICAL
SPECIFICATION TABLE 1.1-1 FOR REQUIRED NUMBER OF FULLY
TENSIONED REACTOR PRESSURE VESSEL HEAD CLOSURE BOLTS (EPID
L-2023-LLA-0108)

Dear James Barstow:

The U.S. Nuclear Regulatory Commission (Commission) has issued the enclosed Amendment No. 168 to Facility Operating License No. NPF-90 and Amendment No. 74 to Facility Operating License No. NPF-96 for the Watts Bar Nuclear Plant, Units 1 and 2, respectively. These amendments are in response to your application dated August 7, 2023.

The amendments permanently revise Watts Bar Nuclear Plant, Units 1 and 2, Technical Specification Table 1.1-1, "MODES," footnotes (b) and (c) to allow continued operation of Watts Bar, Units 1 and 2, with at least 53 of 54 reactor pressure vessel head closure bolts fully tensioned.

A copy of our related safety evaluation is also enclosed. Notice of issuance will be included in the Commission's *Federal Register* notice.

Sincerely,

/RA/

Kimberly J. Green, Senior Project Manager
Plant Licensing Branch II-2
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket Nos. 50-390 and 50-391

Enclosures:

1. Amendment No. 168 to NPF-90
2. Amendment No. 74 to NPF-96
3. Safety Evaluation

cc: Listserv



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

TENNESSEE VALLEY AUTHORITY

DOCKET NO. 50-390

WATTS BAR NUCLEAR PLANT, UNIT 1

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 168
License No. NPF-90

1. The U.S. Nuclear Regulatory Commission (the Commission) has found that:
 - A. The application for amendment by Tennessee Valley Authority (TVA, the licensee) dated August 7, 2023, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's rules and regulations set forth in 10 CFR Chapter I;
 - B. The facility will operate in conformity with the application, the provisions of the Act, and the rules and regulations of the Commission;
 - C. There is reasonable assurance (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the Commission's regulations;
 - D. The issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public; and
 - E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.

2. Accordingly, the license is amended by changes to the Technical Specifications as indicated in the attachment to this license amendment, and paragraph 2.C.(2) of Facility Operating License No. NPF-90 is hereby amended to read as follows:

- (2) Technical Specifications and Environmental Protection Plan

- The Technical Specifications contained in Appendix A as revised through Amendment No. 168 and the Environmental Protection Plan contained in Appendix B, both of which are attached hereto, are hereby incorporated into this license. TVA shall operate the facility in accordance with the Technical Specifications and the Environmental Protection Plan.

3. This license amendment is effective as of the date of its issuance, and shall be implemented within 30 days.

FOR THE NUCLEAR REGULATORY COMMISSION

David Wrona, Chief
Plant Licensing Branch II-2
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Attachment:
Changes to the Operating License
and Technical Specifications

Date of Issuance: July 15, 2024

ATTACHMENT TO AMENDMENT NO. 168

WATTS BAR NUCLEAR PLANT, UNIT 1

FACILITY OPERATING LICENSE NO. NPF-90

DOCKET NO. 50-390

Replace page 3 of Facility Operating License No. NPF-90 with the attached revised page 3. The revised page is identified by amendment number and contains a marginal line indicating the area of change.

Replace the following page of the Appendix A, Technical Specifications, with the attached page. The revised page is identified by amendment number and contains marginal lines indicating the area of change.

Remove Page

1.1-7

Insert Page

1.1-7

- (4) TVA, pursuant to the Act and 10 CFR Parts 30, 40 and 70, to receive, possess, and use in amounts as required, any byproduct, source or special nuclear material without restriction to chemical or physical form, for sample analysis, instrument calibration, or other activity associated with radioactive apparatus or components; and
- (5) TVA, pursuant to the Act and 10 CFR Parts 30, 40 and 70, to possess, but not separate, such byproduct and special nuclear materials as may be produced by the operation of the facility.

C. This license shall be deemed to contain and is subject to the conditions specified in the Commission's regulations set forth in 10 CFR Chapter I and is subject to all applicable provisions of the Act and to the rules, regulations, and orders of the Commission now or hereafter in effect, and is subject to the additional conditions specified or incorporated below.

(1) Maximum Power Level

TVA is authorized to operate the facility at reactor core power levels not in excess of 3459 megawatts thermal.

(2) Technical Specifications and Environmental Protection Plan

The Technical Specifications contained in Appendix A as revised through Amendment No. 168 and the Environmental Protection Plan contained in Appendix B, both of which are attached hereto, are hereby incorporated into this license. TVA shall operate the facility in accordance with the Technical Specifications and the Environmental Protection Plan.

(3) Safety Parameter Display System (SPDS) (Section 18.2 of SER Supplements 5 and 15)

Prior to startup following the first refueling outage, TVA shall accomplish the necessary activities, provide acceptable responses, and implement all proposed corrective actions related to having the Watts Bar Unit 1 SPDS operational.

(4) Vehicle Bomb Control Program (Section 13.6.9 of SSER 20)

During the period of the exemption granted in paragraph 2.D.(3) of this license, in implementing the power ascension phase of the approved initial test program, TVA shall not exceed 50% power until the requirements of 10 CFR 73.55(c)(7) and (8) are fully implemented. TVA shall submit a letter under oath or affirmation when the requirements of 73.55(c)(7) and (8) have been fully implemented.

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	≥ 0.99	> 5	NA
2	Startup	≥ 0.99	≤ 5	NA
3	Hot Standby	< 0.99	NA	≥ 350
4	Hot Shutdown (b)	< 0.99	NA	$350 > T_{avg} > 200$
5	Cold Shutdown (b)	< 0.99	NA	≤ 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.



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

TENNESSEE VALLEY AUTHORITY

DOCKET NO. 50-391

WATTS BAR NUCLEAR PLANT, UNIT 2

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 74
License No. NPF-96

1. The U.S. Nuclear Regulatory Commission (the Commission) has found that:
 - A. The application for amendment by Tennessee Valley Authority (TVA, the licensee) dated August 7, 2023, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's rules and regulations set forth in 10 CFR Chapter I;
 - B. The facility will operate in conformity with the application, the provisions of the Act, and the rules and regulations of the Commission;
 - C. There is reasonable assurance (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the Commission's regulations;
 - D. The issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public; and
 - E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.

2. Accordingly, the license is amended by changes to the Technical Specifications as indicated in the attachment to this license amendment, and paragraph 2.C.(2) of Facility Operating License No. NPF-96 is hereby amended to read as follows:

- (2) Technical Specifications and Environmental Protection Plan

The Technical Specifications contained in Appendix A as revised through Amendment No. 74 and the Environmental Protection Plan contained in Appendix B, both of which are attached hereto, are hereby incorporated into this license. TVA shall operate the facility in accordance with the Technical Specifications and the Environmental Protection Plan.

3. This license amendment is effective as of the date of its issuance, and shall be implemented within 30 days.

FOR THE NUCLEAR REGULATORY COMMISSION

David Wrona, Chief
Plant Licensing Branch II-2
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Attachment:
Changes to the Operating License
and Technical Specifications

Date of Issuance: July 15, 2024

ATTACHMENT TO AMENDMENT NO. 74
WATTS BAR NUCLEAR PLANT, UNIT 2
FACILITY OPERATING LICENSE NO. NPF-96
DOCKET NO. 50-391

Replace page 3 of Facility Operating License No. NPF-96 with the attached revised page 3. The revised page is identified by amendment number and contains a marginal line indicating the area of change.

Replace the following page of the Appendix A, Technical Specifications, with the attached page. The revised page is identified by amendment number and contains marginal lines indicating the area of change.

Remove Page

1.1-8

Insert Page

1.1-8

C. The license shall be deemed to contain and is subject to the conditions specified in the Commission's regulations set forth in 10 CFR Chapter I and is subject to all applicable provisions of the Act, and to the rules, regulations, and orders of the Commission now or hereafter in effect, and is subject to the additional conditions specified or incorporated below.

(1) Maximum Power Level

TVA is authorized to operate the facility at reactor core power levels not in excess of 3459 megawatts thermal.

(2) Technical Specifications and Environmental Protection Plan

The Technical Specifications contained in Appendix A as revised through Amendment No. 74 and the Environmental Protection Plan contained in Appendix B, both of which are attached hereto, are hereby incorporated into this license. TVA shall operate the facility in accordance with the Technical Specifications and the Environmental Protection Plan.

(3) TVA shall implement permanent modifications to prevent overtopping of the embankments of the Fort Loudon Dam due to the Probable Maximum Flood by June 30, 2018.

(4) FULL SPECTRUM LOCA Methodology shall be implemented when the WBN Unit 2 steam generators are replaced with steam generators equivalent to the existing steam generators at WBN Unit 1.

(5) By December 31, 2019, the licensee shall report to the NRC that the actions to resolve the issues identified in Bulletin 2012-01, "Design Vulnerability in Electrical Power System," have been implemented.

(6) The licensee shall maintain in effect the provisions of the physical security plan, security personnel training and qualification plan, and safeguards contingency plan, and all amendments made pursuant to the authority of 10 CFR 50.90 and 50.54(p).

(7) TVA shall fully implement and maintain in effect all provisions of the Commission approved cyber security plan (CSP), including changes made pursuant to the authority of 10 CFR 50.90 and 10 CFR 50.54(p). The TVA approved CSP was discussed in NUREG-0847, Supplement 28, as amended by changes approved in License Amendment No. 7.

(8) TVA shall implement and maintain in effect all provisions of the approved fire protection program as described in the Fire Protection Report for the facility, as described in NUREG-0847, Supplement 29, subject to the following provision:

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	≥ 0.99	> 5	NA
2	Startup	≥ 0.99	≤ 5	NA
3	Hot Standby	< 0.99	NA	≥ 350
4	Hot Shutdown ^(b)	< 0.99	NA	$350 > T_{avg} > 200$
5	Cold Shutdown ^(b)	< 0.99	NA	≤ 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.



UNITED STATES
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WASHINGTON, D.C. 20555-0001

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NOS. 168 AND 74

TO FACILITY OPERATING LICENSE NOS. NPF-90 AND NPF-96

TENNESSEE VALLEY AUTHORITY

WATTS BAR NUCLEAR PLANT, UNITS 1 AND 2

DOCKET NOS. 50-390 AND 50-391

1.0 INTRODUCTION

By application dated August 7, 2023 (Agencywide Documents Access Management System (ADAMS) Accession No. ML23219A011), the Tennessee Valley Authority (TVA, the licensee), submitted a license amendment request (LAR) for changes to the Watts Bar Nuclear Plant (Watts Bar), Units 1 and 2, technical specifications (TSs). The requested changes would permanently revise Watts Bar, Units 1 and 2, TS Table 1.1-1, "MODES," footnotes (b) and (c) to allow operation of Watts Bar, Units 1 and 2, with at least 53 of 54 reactor pressure vessel (RPV) head closure bolts or studs (used interchangeably) fully tensioned.

2.0 REGULATORY EVALUATION

2.1 System Description and Background

The Watts Bar reactor pressure vessels, top and bottom heads, and closure studs are described in TVA's previous emergency license amendment request for Watts Bar, Unit 1 (ML23124A403) and in the Watts Bar Dual-Unit Updated Final Safety Analysis Report (UFSAR), section 5.4.2 (ML22152A097).

The RPV is cylindrical with a welded hemispherical bottom head and a removable, bolted, flanged, and gasketed, hemispherical upper head. The reactor vessel flange and head are sealed by two hollow metallic O-rings and are secured by the reactor vessel head closure studs. There are 54 locations for the closure studs to be installed.

By application dated May 4, 2023 (ML23124A403), TVA submitted an emergency LAR that requested changes to Watts Bar, Unit 1, TS Table 1.1-1, to add two one-time use footnote statements regarding the RPV head closure bolt requirements. The LAR included 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." The request was made because during Unit 1 refueling outage 16, stud number 34 was found to be damaged,

and due to the circumstances at the time, was removed from service. Subsequently, during Unit 1 refueling outage 18, the NRC staff challenged TVA's compliance with footnotes (b) and (c) to TS Table 1.1-1, and TVA concluded that a change to the TS definitions for Modes 4, 5, and 6 was appropriate.

The NRC evaluated the emergency LAR, and by letter dated May 5, 2023, approved the emergency amendment, allowing Watts Bar, Unit 1, to operate with 53 of 54 RPV head closure bolts fully tensioned through Cycle 19 (ML23125A220).

By letter dated June 1, 2023 (ML23152A150), TVA transmitted Revision 3 to WCAP-18774-P and WCAP-18774-NP to provide a non-proprietary version of the WCAP, as committed in the emergency LAR. The WCAP report provides the analyses and evaluations to substantiate the structural adequacy of the Watts Bar, Units 1 and 2, RPVs for operation with one stud out of service for multiple fuel cycles up to the 40-year design life.

2.2 Requested Changes

The Watts Bar TS operational modes table is used to define the operating conditions under which individual limiting conditions for operation (LCOs) are applicable (e.g., an individual LCO may be required to be met while in Modes 1 or 2, but not in the other operating modes).

The licensee proposed the following changes to Watts Bar, Units 1 and 2, TS Table 1.1-1 footnotes (new text shown in **bold** and deleted text shown in ~~strikeout~~):

Unit 1

- (b) ~~For transitioning from the Unit 1 Cycle 18 refueling outage, through Cycle 19, and prior to Cycle 20 operation, a~~ **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, o~~ **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).~~

Unit 2

- (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.

2.3 Regulations and Guidance

The regulations relevant to the NRC staff's review are summarized below.

The Commission's regulatory requirements related to the content of TSs are set forth in Title 10 of the *Code of Federal Regulations* (10 CFR), Section 50.36, "Technical Specifications," which requires that the TSs include items in eight specific categories: (1) safety limits, limiting safety system settings and limiting control settings; (2) LCOs; (3) surveillance requirements; (4) design features; (5) administrative controls; (6) decommissioning; (7) initial notification; and (8) written reports.

Section 50.36(b) of 10 CFR states, in part, that the TSs will be derived from the analyses and evaluations included in the safety analysis report, and amendments thereto, submitted pursuant to Section 50.34, "Contents of applications; technical information."

Section 50.36(c)(2)(i) of 10 CFR requires that TSs include LCOs, which "are the lowest functional capability or performance levels of equipment required for safe operation of the facility." The regulation also requires that when an LCO of a nuclear reactor is not met, the licensee shall shut down the reactor or follow any remedial action permitted by the TSs until the condition can be met.

Section 50.55a, "Codes and standards," of 10 CFR specifies standards approved for incorporation by reference in the NRC regulations, including Section III and Section XI of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code (BPV Code).

Appendix A, "General Design Criteria [GDC] for Nuclear Power Plants," to 10 CFR Part 50 establishes the minimum requirements for the principal design criteria for water-cooled nuclear power plants. The principal design criteria establish the necessary design, fabrication, construction, testing, and performance requirements for structures, systems, and components important to safety. According to section 3.1.1 of the Watts Bar Dual-Unit UFSAR, the plant was designed to meet the intent of the "Proposed General Design Criteria for Nuclear Power Plant Construction Permits," published in July 1967. The Watts Bar construction permits were issued in January 1973. The Watts Bar plant, in general, meets the intent of the NRC GDC published as Appendix A to 10 CFR Part 50 in July 1971, as discussed in UFSAR section 3.1.2 (ML22152A097).

The NRC staff determined that the following GDC are relevant to the review:

- GDC 14, "Reactor coolant pressure boundary," states that the design, fabrication, erection, and testing of the reactor coolant pressure boundary shall be so as to have an extremely low probability of abnormal leakage, or rapidly propagating failure, and of gross rupture.
- GDC 30, "Quality of reactor coolant pressure boundary," states in part, that components comprising the reactor coolant pressure boundary shall be designed, fabricated, erected, and tested to the highest quality standards practical.

3.0 TECHNICAL EVALUATION

3.1 Acceptance Criteria

The Watts Bar, Units 1 and 2, RPVs were designed and fabricated in accordance with the requirements of ASME BPV Code, Section III, NB-3200, 1971 Edition through Winter 1971 Addenda.

The following acceptance criteria were used by Westinghouse Electric Company, LLC (Westinghouse), in WCAP-18774-P/NP, Revision 3, for the evaluation of one stud out of service:

- The maximum stud average service stress shall be less than $2S_m$ (S_m : material stress intensity) at operating temperature in accordance with the ASME BPV Code, Section III, 1971 Edition.
- The maximum stud service stress, including bending, shall be less than $3S_m$ at operating temperature in accordance with the ASME BPV Code, Section III, 1971 Edition.
- The bearing stress in the closure head flange under the stud washers shall be less than S_y (S_y : material yielding stress) at operating temperature in accordance with the ASME BPV Code, Section III, 1971 Edition.
- The reactor vessel flange separation at the O-rings must remain less than the minimum O-ring springback of 0.015 inch for Inconel 718 O-rings with 0.455-inch tube cross-sectional diameter.
- The maximum cumulative fatigue usage factor for the closure studs shall be less than 1.0 in accordance with the ASME BPV Code, Section III, 1971 Edition.
- The thread shear stress during stud tensioning and de-tensioning is limited to $0.4S_y$ in accordance with the "Specification of Design, Fabrication & Erection of Structural Steels for Buildings," 1963 Edition, American Institute of Steel Construction (AISC). This limit is used to ultimately determine thread engagement.
- The thread shear stress during normal operation is limited to $0.6S_m$ in accordance with the ASME BPV Code, Section III, 1971 Edition. This limit is used to ultimately determine thread engagement.
- The calculated required length of thread engagement shall be less than the design length of thread engagement for each stud.

3.2 Structural Integrity Evaluation

The NRC staff evaluated the impact to justify reactor operation with only 53 studs (or bolts) fully tensioned and with one stud hole location out of service with no stud load acting at that location.

The NRC staff reviewed the licensee's technical basis document for the structural integrity evaluation, i.e., WCAP-18774-P/NP, Revision 3 (ML23152A150 (non-proprietary) and ML23152A151 (proprietary)) and its two attached calculation notes (Appendices A and B).

To determine the effect of the out-of-service stud, the licensee defined the distribution of the forces (or strains) in the studs based on the cross-section of the bolted flange. Based on the distribution of forces, the licensee analyzed the increase in load in the two studs directly adjacent to the un-tensioned stud, which are the most impacted studs. The licensee evaluated the percentage increase in the stress in the adjacent stud due to the out-of-service stud location. The evaluation addressed that Watts Bar, Unit 2, deviated stud number 3 has a reduced tensile area due to machining deviation that reduced the stud shank diameter. The

evaluation result showed that the maximum average tensile stresses for adjacent studs are less than the allowable of $2S_m$, or 73.26 kilopounds per square inch (ksi). The licensee evaluated the bending stress contribution result from the inclination of the head across the reactor vessel flange due to the linear distribution of the loading in the studs. Adding the additional membrane and bending stresses, the maximum stud service stress increased but was still within the allowable of $3S_m$, or 109.9 ksi. The NRC staff verified the stud stress increase due to an out-of-service bolt is still less than the ASME BPV Code allowable value.

The licensee evaluated the bearing stress under the closure nut and washer. The washer is compressed into the top surface of the head flange by the nut with the stud tensile loading. The maximum stud tensile load for the studs adjacent to the out-of-service stud generates the maximum bearing stress under the washer. The bearing stress under the washer of the two studs adjacent to the out-of-service stud exceeds the allowable bearing stress of S_y when the maximum stud preload elongation tolerance is applied during reactor vessel stud tensioning. The licensee stated that if the maximum stud preload elongation is limited to the value in accordance with the original reactor vessel stud tensioning procedure, the maximum bearing stress under the washers is less than the allowable S_y (or 44.5 ksi) as required by the ASME BPV Code. The evaluation stated that during stud elongation, the stud preload elongation in the two studs adjacent to the out-of-service stud must not be greater than the value in accordance with the original Watts Bar, Units 1 and 2, stud tensioning procedures. The NRC staff finds the use of the preload elongation limit of the original reactor vessel stud tensioning procedure to be acceptable because the bearing stress under the two studs adjacent to the out-of-service stud would be below the value allowed by the ASME BPV Code.

The licensee calculated stud hole thread shear stress based maximum stud tensioning load for the specific tensioner used by industry. The result showed that the thread shear stress due to stud tensioning and de-tensioning is within the allowable of $0.4S_y$ in accordance with the AISC manual. The evaluation of the stud hole shear stress during normal operation/plant heat up showed that the stud hole thread shear stress is within the allowable of $0.6S_m$ in accordance with the ASME BPV Code. The licensee calculated the required lengths of closure stud thread engagement in the reactor vessel flange stud holes for both stud tensioning and normal operation based on the shear stress in the threads. The licensee applied the maximum load during stud tensioning to calculate the required length of thread engagement. The calculated required length of thread engagement is less than the design length of thread engagement for each stud. The length of stud thread engagement provides information to the licensee to properly tension the studs without overstressing the studs and flange.

The NRC staff reviewed the licensee's evaluation for calculating the maximum cumulative usage factor (CUF) for the studs adjacent to the out-of-service stud. The evaluation increased the alternating stress to demonstrate that the CUF is less than 1.0 in accordance with ASME BPV Code requirement. The NRC staff finds that the licensee's alternating stress evaluation method is adequate and the CUF is less than 1.0, which meets the ASME BPV Code limit.

In addition, the NRC staff reviewed the licensee's evaluation for calculating the increases in RPV head flange separation. The staff concurs that the calculated maximum gap at the inner O-ring is less than the minimum O-ring springback. Therefore, the NRC staff finds that the licensee has provided reasonable assurance that the leakage integrity of the RPV head closure flange will be maintained during reactor operation with at least 53 head closure bolts fully tensioned. As such, the staff finds that the RPV, operating with at least 53 head closure bolts fully tensioned, will continue to meet GDC 14.

The NRC staff notes that the licensee included information regarding its adoption and continued use of ASME Code Case N-864, "Reactor Vessel Threads in Flange Examinations, Section XI, Division 1," with one RPV head closure stud not in use. The NRC staff acknowledges the inclusion of this information in the LAR; however, the staff did not consider this information or rely on it in making its decision regarding the acceptability of the analysis provided in WCAP-18774-P/NP and the proposed changes to the Watts Bar, Units 1 and 2, TS Table 1.1-1.

3.3 Evaluation of Proposes TS Changes

The NRC staff reviewed the proposed TS changes against the requirements of 10 CFR 50.36.

Watts Bar, Units 1 and 2, TSs define the terms "operable" and "operability" as:

A system, subsystem, train, component, or device shall be OPERABLE or have OPERABILITY when it is capable of performing its specified safety function(s) and when all necessary attendant instrumentation, controls, normal or emergency electrical power, cooling and seal water, lubrication, and other auxiliary equipment that are required for the system, subsystem, train, component, or device to perform its specified safety function(s) are also capable of performing their related support function(s).

Leak tightness of the RPV flange, which is part of the overall reactor coolant pressure boundary (RCPB), is necessary for specific TS LCOs to be met. TS LCO 3.4.4, "RCS Loops - MODES 1 and 2," is an example of an LCO that relies on an intact RCPB. The NRC staff's evaluation in section 3.2 determined that the leakage integrity of the RPV head closure flange will be maintained during reactor operation with at least 53 head closure bolts fully tensioned, and thereby will continue to support the RCPB function as required by 10 CFR 50.36.

Based on the NRC staff's evaluation in section 3.2 above, the staff finds that the licensee's analysis demonstrates there is reasonable assurance that operating the plant with at least 53 fully tensioned bolts at each Watts Bar unit will not adversely affect the safe operation of Watts Bar units. The NRC staff finds that the minimum number of fully tensioned bolts specified in the TSs, as modified, would continue to ensure the operability of the RPV in plant operational Modes 1 - 5 since the RPV closure studs will continue to perform their support functions. Therefore, the NRC staff finds that the proposed changes to Watts Bar, Units 1 and 2, TS Table 1.1-1, are acceptable because the revision to the TSs is derived from analyses have been determined to be acceptable to the staff, and therefore, satisfies the requirement of 10 CFR 50.36(b).

3.4 Technical Conclusion

Based on the evaluation above, the NRC finds that the licensee has provided reasonable assurance that neither the function nor structural integrity of the Watts Bar, Units 1 and 2, RPVs and closure studs will be compromised when the RPVs operate with one closure stud out of service, provided the balance of the closure studs are properly tensioned in accordance with the licensee's tensioning procedure. The NRC staff also finds that the Watts Bar RPVs, when operating with at least 53 of 54 RPV closure bolts fully tensioned, will continue meet GDC 14. In addition, NRC staff finds that the proposed changes to Watts Bar, Units 1 and 2, TS Table 1.1-1, "MODES," satisfy the requirements of 10 CFR 50.36(b) because the changes are derived from analyses that the NRC finds acceptable.

4.0 STATE CONSULTATION

In accordance with the Commission's regulations, the Tennessee State official was notified of the proposed issuance of the amendment on March 14, 2024. The State official had no comments.

5.0 ENVIRONMENTAL CONSIDERATION

The amendments change a requirement with respect to installation or use of a facility component located within the restricted area as defined in 10 CFR Part 20. The NRC staff has determined that the amendments involve no significant increase in the amounts, and no significant change in the types, of any effluents that may be released offsite, and that there is no significant increase in individual or cumulative occupational radiation exposure. The Commission previously issued a proposed finding that the amendment involves no significant hazards consideration published in the *Federal Register* on October 31, 2023 (88 FR 74532), and there has been no public comment on such finding. Accordingly, the amendments meet the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9). Pursuant to 10 CFR 51.22(b), no environmental impact statement or environmental assessment need be prepared in connection with the issuance of the amendments.

6.0 CONCLUSION

The Commission has concluded, based on the considerations discussed above, that: (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, (2) there is reasonable assurance that such activities will be conducted in compliance with the Commission's regulations, and (3) the issuance of the amendment will not be inimical to the common defense and security or to the health and safety of the public.

7.0 REFERENCES

Principal Contributors: K. Hsu, NRR
R. Grover, NRR

Date: July 15, 2024

SUBJECT: WATTS BAR NUCLEAR PLANT, UNITS 1 AND 2 - ISSUANCE OF AMENDMENT NOS. 168 AND 74 REGARDING REVISION TO TECHNICAL SPECIFICATION TABLE 1.1-1 FOR REQUIRED NUMBER OF FULLY TENSIONED REACTOR PRESSURE VESSEL HEAD CLOSURE BOLTS (EPID L-2023-LLA-0108) DATED JULY 15, 2024

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PUBLIC

RidsACRS_MailCTR Resource

RidsNrrDorlLpl2-2 Resource

RidsNrrPMWattsBar Resource

RidsNrrLAABaxter Resource

RidsRgn2MailCenter Resource

RidsNrrDexEmib Resource

RidsNrrDnrlNvib Resource

RidsNrrDssStsb Resource

DDijamco, NRR

KHsu, NRR

RGrover, NRR

ADAMS Accession No.: ML24170A800

OFFICE	NRR/DORL/LPL2-2/PM	NRR/DORL/LPL2-2/LA	NRR/DEX/EMIB/BC	NRR/DNRL/NVIB/BC
NAME	KGreen	ABaxter	SBailey	ABuford
DATE	6/17/24	6/21/24	4/1/24	6/25/24
OFFICE	NRR/DSS/STSB/BC	OGC - NLO	NRR/DORL/LPL2-2/BC	NRR/DORL/LPL2-2/PM
NAME	SMehta	IMurphy	DWrona	KGreen
DATE	4/12/24	7/2/24	7/15/24	7/15/24

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